

# MODERN Machine Shop

HOWARD CAMPBELL, Editor

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A  
Magazine  
for  
Machine  
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Executives

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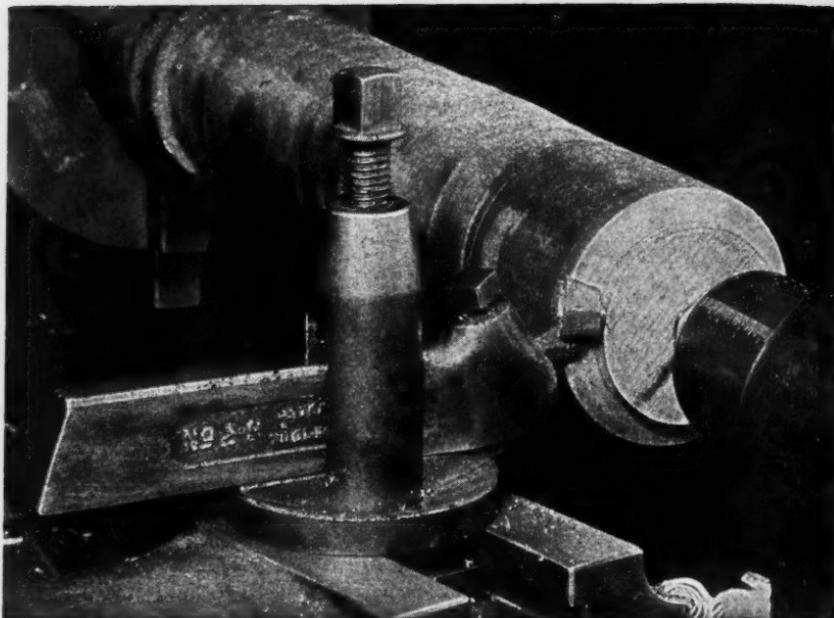
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# MODERN Machine Shop

CINCINNATI, OHIO

VOL. 7, NO. 9

FEBRUARY, 1935

## Welding of Boiler Flues and Superheater Units

BY JAS. M. VOSSLER

**A**TOMOGENEOUS welding is to-day playing a very important role in the installation and reclamation of boiler flues and the reclamation of superheater units. As in all other branches of railway shop work, autogenous welding was at first used very cautiously, until its possibilities and limitations were determined. Now, since considerable knowledge has been gained of the process, it is being developed very rapidly, although very carefully, in all branches of railway shop work.

The practice of welding flues to the back flue sheet has eliminated the necessity of frequently working the flues to stop leaks, and has effected considerable savings. Fig. 1 illustrates a cross-section of the old method of installing the flues in the rear flue sheet. The first step in welding the flues to the sheet was to make a small fillet weld around the bead of the flue, as shown in cross-section in Fig. 2.

As will be seen in the latter illustration, the weld is depended on for a steam tight joint only, and little or no strength in staying the flue sheet is received. The desired strength to stay the sheet is obtained through the expanding and beading.

In order to secure a proper weld around the flues, it is necessary to first see that the work is properly prepared. Before the flues are applied, the flue sheet should be thoroughly cleaned with the sandblast. After the copper ferrules have been properly placed, the flues should be put in position in the sheet. The flues should then be

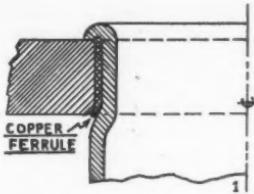


Fig. 1.—Drawing illustrating method commonly used in installing locomotive boiler flues in rear flue sheet.

expanded, and prossered, and then beaded. It has been found best to place the copper furrule back in the sheet about  $1/16$  inch from the face of the sheet, since, in working the flue, the copper is expanded out, and if placed too far toward the face of the sheet, will extend out under the edge of the bead. The copper thus exposed will interfere with the weld-

ing and cause small leaks in the weld due to poor fusion and porosity. Care must also be exercised to see that no more oil than is absolutely necessary is used on the prosser pin. If too much oil is used, it will run around the outside of the bead, and a weld made on an oily surface will be hard and porous. After the flue has been prossered, any oil that is on the sheet around the flue should be carefully removed. This is best done with an oxy-acetylene torch, using an oxidizing flame. Care should also be exercised to see that the edge of the bead sets tight against the flue sheet.

It was formerly thought best to wait until after the locomotive had been fired up before welding the flues. Then, after the boiler had cooled down, the flue sheet and flue beads were thoroughly sand blasted and the flues were welded. It was also thought necessary to have water in the boiler when the flues were welded. Experience has shown that it is best to sand-blast the flue sheet before the flues are applied, as described above, and to weld the flues without water in the boiler, before the locomotive is fired up. If the boiler is fired up before the flues are welded, a carbon deposit that is very difficult to remove forms between the edge of the flue bead and the flue sheet. This is especially true with oil burning locomotives, and it greatly interferes with the welding. It is easy for the boiler makers to keep the flue sheet clean enough for the welders while the flues are being applied.

When a flue sheet is sand blasted, after the flues have been beaded, the blast will drive small particles of sand between the edge of the flue and the sheet. It is almost impossible to dislodge these sand particles with a wire brush, and when the arc melts the surface of the metal of the flue sheet and flue bead in securing penetration, the sand likewise melts. The

molten sand causes the arc to be erratic, and very difficult to control. It also has an effect on the molten metal in the crater of the arc, as the sand gives the metal a tendency to flow more readily and prevents it from beading up properly.

The best success in flue welding has been secured when the electric arc process is used. Only experienced arc welders should be used for this work, and preferably those that were boiler makers before learning the welding trade.

In welding the flues, the welder should start at the bottom center of the flue and go up one side to the top center. He should then return to the bottom center, and weld the other side of the flue. When he reaches the end of the first bead, he should be very careful to lap the metal over the end of the preceding weld, so that there will be no pin holes left at these ends.

The arc should be held mostly on the flue sheet, and only flashed on the flue bead enough to keep the surface of the flue bead sufficiently molten to properly receive the molten deposited metal, and properly weld to it. If the full stream of the arc is directed steadily against the bead of the flue, it will melt through the bead and a good weld will not be secured, as the thin flue bead will be damaged due to over-heating. Flue beads so overheated generally crack and cause leaks.

It is only necessary to deposit a light fillet weld around the flue bead. The reason for this is apparent when the thinness of the flue bead is considered. Although good welding can be done in welding the flues with  $\frac{5}{32}$  inch rod, the writer prefers  $\frac{1}{8}$  inch rod. With the former, a current of between 140 and 150 amperes is used, while the latter requires one from 120 to 130 amperes.

The welder cannot be too particular about his arc length when welding

flues. It has been the writer's experience that satisfactory results can be secured only with a short arc. Around an eighteen-volt arc is best, and never over twenty volts. Too

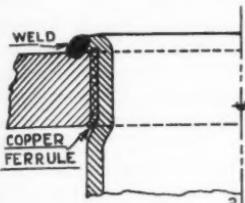


Fig. 2—Former practice included the making of a small fillet weld around the head of the flue.

much stress cannot be laid on the importance of keeping the arc short.

There is no phase of autogenous welding where it is more important to see that a good welding rod is used than in welding flues to the flue sheet of a locomotive boiler. Purity and absolute uniformity of rod are of prime importance if the best results are to be obtained. The chemical analysis of the rod that has been found best for this work conforms to the American Welding Society specification E-No. 1B. It has been the writer's experience, however, that there are many rods which, although conforming to these specifications, do not give satisfactory results when used to make flue and other particular welds. This is due to impurities other than those in the above mentioned specifications, such as entrapped gases, slag and so on.

A careful test should be made to determine the behavior of the rod under the heat of the arc. A rod that will become red hot when a normal welding current is passing through it is not acceptable, since a satisfactory weld cannot be made when the electrode, or welding rod, is at a red heat. Impurities in the rod, which cause the metal to offer a high resistance to the

flow of the electric current, cause this over-heating.

The use of copper ferrules in the application of flues to the back flue sheet was introduced to make it easier to secure a steam tight fit between the flue and the flue sheet. When the flues were expanded the copper would easily be pressed into any irregularity in either the surface of the flue hole or the surface of the flue that is in contact with the copper. This worked very well, but the effect of expansion and contraction due to repeated heating and cooling would eventually cause the flues to leak. It was then necessary to re-work or re-expand the flues in the flue hole to stop the leaks.

As stated above, with the introduction of autogenous welding the idea of welding the flue beads to the flue sheet in order to secure a permanent steam tight joint was conceived. The process, as described above, was developed. After it had been proven successful, the copper ferrules were no longer considered needed. Should they be omitted, a saving in labor and material would be effected and, also, since it would be no longer necessary to bore the flue holes large enough

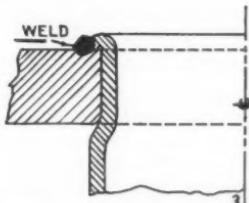


Fig. 3—Cross-section drawing of a flue applied with copper ferrule, but which has been welded.

to receive the copper ferrules, the bridges between the flue holes would be strengthened. Figure 3 shows a cross-section of a flue that has been applied without the copper ferrule, but which has been welded.

### Superheater Flue Application

Superheater flues formerly were applied in the same manner as were the small flues. A cross-section view of the joint between the flue and the flue sheet would appear the same as the

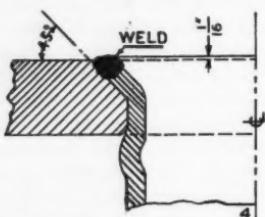


Fig. 4—Cross-section of joint of sheet and flue showing method of countersinking sheet and expanding flue to fill bevel. The joint is shown after the weld has been made.

cross-section shown in Fig. 1. Likewise, Fig. 2 represents the cross-sectional view through the same joint after the practice of depositing a small fillet weld around the flue bead to seal the joint was started. As with the small flues, this was quite effective. Although the weld did make the joint steam tight, and did eliminate the frequent working of the flues, lengthening the life of the flue beads, yet the beads of quite a few of the flues would fire-crack before it was time to renew the flues. This fact made it advisable to figure out some method of applying the flues so as to eliminate the bead, and thus make the joint between the flue and the sheet last as long as the flue. It was also desired to secure a more economical method of making the joint. The investigation resulted in countersinking the sheet as shown in Fig. 5. The end of the flue, as shown in Fig. 4, was laid back on the bevel, so as to leave sufficient space for the weld.

Fig. 4 shows a cross-section of the finished joint, after the weld was made. It will be noticed that the copper ferrule is eliminated, which effects a saving in material. Labor is

also saved, in that about 35 per cent less time is required to make the welds. Experience proved that this method was very effective in applying superheater flues, but it was not successful for small flues. The countersink so weakens the bridges between the small flues that trouble is experienced with the bridges breaking. With the superheater flues, however, the joints give no trouble from the time they are applied until it becomes necessary to remove them, and no trouble has been experienced with the bridges breaking.

The welding of joints to make them steam-tight is not the only operation upon which autogenous welding has been employed effectively and economically. Where only a few pits exist in the flue they can be built up. By the use of this process many flues that would otherwise be scrapped are reclaimed.

As is well known, when a flue is removed from a boiler so that the scale accumulation can be removed, the flue is shortened. This necessitates the application of a short piece called a "safe end" to the firebox end of the flue. It was formerly the practice to forge-weld these end to the flues.

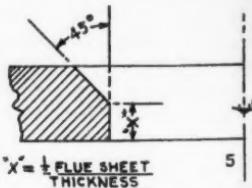


Fig. 5—The sheet is countersunk at a 45-degree angle, to a depth of one-half the thickness of the sheet.

Experience has proven that it is a better practice to weld these "safe ends" to the superheater flues by the oxy-acetylene method. A small, neat ripple weld is used to join the two.

The flue cutter leaves a small bevel on the end of the flue, due to the



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shape of the cutter. It is not necessary to bevel the safe end. The square edge, due to the thinness of the wall, will melt away under the influence of the heat of the oxy-acetylene flame.

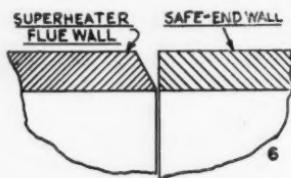


Fig. 6—Cross-section drawing showing safe-end wall and superheater flue aligned for welding.

Fig. 6 shows the cross-section of the walls of the safe end and flue lined up for welding. (As with most of the drawings in this article, the illustration is drawn to an oversize scale for the benefit of the reader.) The finished weld is shown in Fig. 7.

The number of safe ends that can be applied to a superheater flue is limited by the length of the superheater units. This limitation formerly caused many serviceable flues to be scrapped because they were too short



Fig. 7—Diagram illustrating method of welding safe end to flue.

for use. Today these short flues, both small and superheater types, are reclaimed by welding short pieces of flue of proper length onto the flues. These welds are also made with the oxy-acetylene torch, employing the ripple method of welding. Care must be exercised to see that the reinforcement of the weld is not so large that it will not pass through the flue holes in the front flue sheet. Twenty per cent reinforcement is sufficient.

By the above, it can be easily seen that considerable saving can be effected in the flue shop by the proper use of

autogeneous welding. Due to the similar nature of the welding and the close relation between boiler flues and superheater units, it would hardly be proper to discuss the reclamation of one without the other. The fact is that it has been the author's observation that the reclamation of superheater units by autogeneous welding antedates the reclamation of flues by that process by several years.

The first use of autogeneous welding in superheater unit reclamation was in welding up cracks in the return bends. At that time, in cases where the return bends could not be so repaired, they were cut off and the unit threaded to receive a return bend



Fig. 8—Method of reclaiming superheater unit return bends by the use of welding.

of the screwed-on type. After some experimenting, the superheater bend shown in Fig. 8 was developed, and proved to be very successful.

At first the old bend was cut off, and the ends of the tubing were cut to the shape shown in Fig. 9. The tubing was then heated and the ends were bent to the shape shown in Fig. 10. The longitudinal seam thus formed between the two tubes was welded with

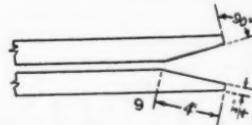


Fig. 9—Drawing illustrating method of cutting the ends of return bend tubes for welding.

an oxy-acetylene torch by the ripple method. The end was then heated and closed by peening. After this was done, it was welded and reinforced about 100 per cent to resist abrasion. The unit was then subjected to the usual hydrostatic test pressure.

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The service received from these bends exceeded expectations. It was apparent, though, that the unit was not quite as efficient as it formerly was, due to having been shortened. This objection was overcome by lengthening the return bends on pieces of proper tubing to between two and three feet long. A section of similar

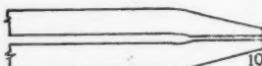


Fig. 10.—Return bend designed to prevent restriction of passage of steam through the bend.

length is then cut from the superheater unit, and the new bend is welded in place. This causes no loss of tubing since the old bend is cut from the removed section of tubing, and a new bend constructed upon it. It is then ready for use in reclaiming another superheater unit.

The high efficiency and the durability of this bend can be easily seen by studying the cross-section shown in Fig. 11. The large volume of space within this bend will be noted. It is so designed as to prevent the restriction of the passage of the steam through the bend. This type of bend has proved exceptionally durable and very resistant to fire cracking.

Another section of the superheater unit that gives trouble is the neck. Abrasion, due to sand, cinders, and so-on weakens this section long before the unit as a whole is worn out. A method of reclaiming these necks was developed whereby a new ball joint was formed on the end of a tube by upsetting one end in a forging machine. The piece of tubing is of sufficient length to include the entire neck portion of the unit, and the lower bend. After the ball joint has been formed, the tubes are bent into the proper shape, and welded to the main tubes just beyond the lower bend.

The ripple type of weld, as with the flues mentioned above, is also used

in welding the superheater unit tubing together. Care must be exercised to see that there are no metal projections or runs extending into the tube. This is easy to prevent. Due to the thinness of the tube it should not be beveled for welding as beveling would make it more difficult to prevent the "runs" from extending into the center of the tube. The tubes must be cut off square, preferably with a hack saw, and butted together. Using a small and carefully adjusted neutral flame, the welder should melt the joint together, using no filler rod in this first step. The metal of the tubing is merely flowed together until all of the opening completely around the cut has been joined. After this the welder should take his filler rod and torch and place a neat ripple weld around the joint. The reinforcement should be about fifty per cent.

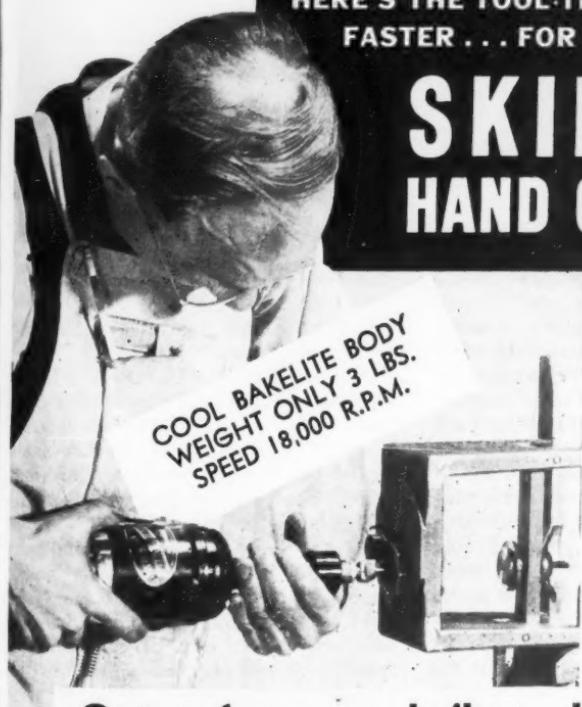
Before a welder is permitted to do this work, he should be required to make sample welds on odd pieces of tubing and cut them open for examination. The inner surface must be free



Fig. 11.—Diagram of type of return bend which has proved exceptionally durable and fire-resistant.

of all runs. If the welding procedure described above is followed, no trouble will be experienced with the flow restricting runs. As with the return bends described above, a hydrostatic pressure is used to test these welds after they are completed.

In selecting a type of welding rod for use as described above, for flue welding, too much emphasis cannot be laid on the importance of using only the best grade of welding rod. Rods that have been found best are those which conform to the American Welding Society's specification G No. 1A.



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# The Machine Shop Earns Its Keep in a Publishing House

BY CARROLL E. PELLISSIER

**T**H E true functions of a modern machine shop are manifold. No longer must its activities be confined to repair work only where it is classed more as a non-productive unit or part of overhead costs from which there are no very obvious tangible returns in dollars and cents. The modern machine shop has extended its activities and has become a most potent factor in the reduction of overhead costs through lowering of production costs by promoting greater machine efficiency. An outstanding example of a machine shop of this type is the one operated by the Christian Science Publishing Society of Boston, Mass.,



Home of Christian Science Publishing Society,  
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under the guidance of Frank H. Henricksen, foreman.

This machine shop serves four buildings, all of them of exceptionally good size. One is the Christian Science Mother Church, another an office building of the society, and the third and fourth, the new buildings of the publishing society.

In these new buildings we find published an international daily newspaper (*The Christian Science Monitor*), several magazines and periodicals, and books and literature of all types. Completely equipped are the various press rooms, newspaper, periodical and job, the bindery, the composing, type casting, photo engraving, editorial, foundry, stereotype, mailing, circulation, advertising and the various and sundry other departments that make up a large publishing house.



Sectional view of the ma-  
chine shop in the Christian  
Science Publishing Building.



Another view of the machine shop.

tools and several Hallowell steel benches.

Of particular interest are the many intricate and perplexing problems assigned to the ma-

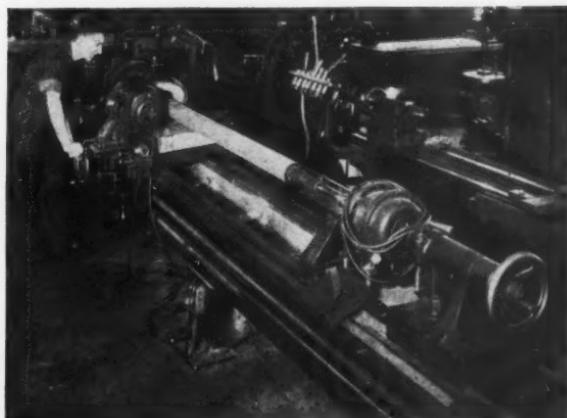
chine shop for solution. For instance, a mat dryer was needed in the foundry room. The machine shop was requested to supply one. Using some sheet metal and asbestos they constructed a dryer that met the need perfectly. It was curved on the top using the same degree of curvature as the casting box, was heated with electric coils and was fitted to the wall. A lid opened at the top to admit the wet mat and closed down tightly over it. It was simple but it worked perfectly, filling the need and saving money.

With the number of presses used here the grinding of the rubber vibrator and form rollers became a ma-

The task that faces Mr. Henricksen and his crew of mechanics is far from easy. To assist him in this work he has assembled a crew that for general efficiency and all around technical ability would be difficult to duplicate.

When Mr. Henricksen found it increasingly difficult to hire the type of men he needed he began the policy of training his own men. As a direct result he has a crew today that are able to handle almost any type of job to meet any emergency that might arise.

A brief list of various pieces of equipment here is as follows: The shop equipment includes four lathes, a Gould & Eberhardt 18-inch shaper, a Brown & Sharpe gear cutter, a grinder, a tool room spot welding machine, an acetylene welding machine, a Cincinnati Universal Milling machine; necessary blacksmith equipment and



In the foreground is shown a lathe equipped with a grinding unit for refinishing rollers. The rollers run in their own bearings and special attachment provides for grinding a "crown" on the rubber roller.

jor problem. The vibrator roller, which distributes the ink to the cylinder, is from 4 to 4½ inches in diameter and the form roller which takes the ink from the cylinder to the printing form is some 6 inches in diameter. These rollers, when used over a certain period, swell and get rough and to overcome this they must be ground to size again and carefully smoothed and polished.

Having no particular grinding or polishing equipment it became necessary to construct something that would do this work. Taking the old Flather lathe, Mr. Henricksen and his assistants made it into a tool that does the job very effectively.

A motor carrying a grinding wheel was bolted to an angle plate and the plate, in turn, was mounted on the cross slide of the lathe. To the rear of the lathe was attached a steel track approximately 8 ft. long, running parallel with the bed of the lathe. A steel arm was attached at one end to the grinding unit and at the other end to a small wheel which runs on the track. To keep the wheel in contact with the track at all times, weights were suspended from steel cables running over pulleys at the rear of the carriage, the steel cables being attached to the grinding unit also. Thus the weights exerted a constant pull on the unit.

Inasmuch as the roll is "crowned"; that is, it is about 1-32 inch larger in diameter at the center of the roll than at the ends, the track was bowed accordingly. The grinding unit is equipped with a 12-inch emery wheel. The roller is located in the lathe in individual journal boxes, making the roller independent of the lathe itself and allowing it to operate on the same bearings and under the same conditions as though it were in place in the printing press. For polishing, a fine grade of emery cloth is used, the roll revolving at a speed of 1800 r.p.m.

Sometime past a great deal of trouble was experienced with the cams, which were made of cast iron and which broke frequently in operation. To overcome this difficulty, the machine shop now makes these cams of hardened tool steel, avoiding the difficulty completely. The breakage of mailing machine spiders was also eliminated by substituting bronze for cast iron.

Mr. Henricksen has found, after careful investigation and experiment, that substitution of materials in the right places will solve the problem of excessive noise and increase the life of the various mechanical units. For example, gears made of Formica and similar materials have shown greater wearing powers, run more smoothly, and eliminate noise to such a degree that they have replaced metals completely in some instances.

A printing plant performs a valuable service for society, but this service is only possible because of the assistance of the machine shop.

---

**No. 2 CINCINNATI CUTTER GRINDER**  
Users of all types of cutting tools will be interested in the new "Facts on Features" Catalog M627, which has just been issued by The Cincinnati Milling Machine Co., Cincinnati, Ohio.

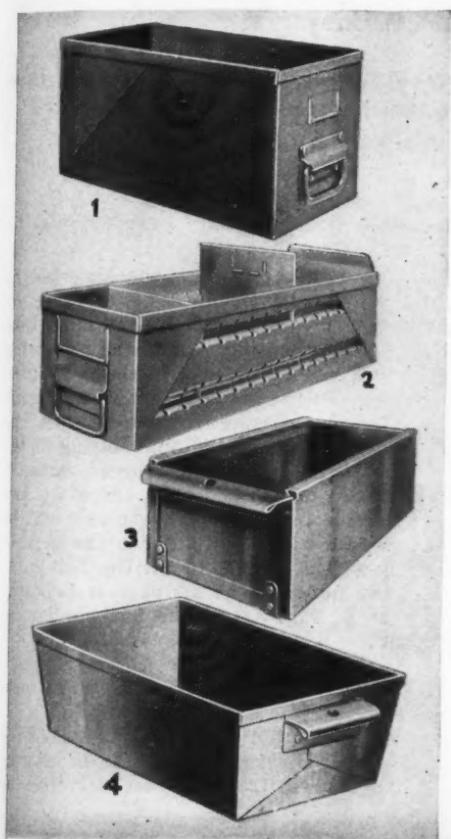
This new catalog illustrates and describes the many features of the No. 2 Cincinnati Cutter Grinder, both plain and universal. In addition to a discussion of the mechanical features of the machine, many interesting cutter sharpening set-ups are illustrated and described.

Copies of this new catalog M627 may be had by writing the company.

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# Punch Press Operations and Tools, V

*In this article the author continues the subject of bending dies and the factors affecting their design and operation, closing with a discussion of "double benders."*

BY C. L. SZALANCKY

Die Designer, Westinghouse Elec. & Mfg. Co.

THE drawing Fig. 1 illustrates the design of what is commonly known as an "L-bent" blank. This particular blank is of  $0.094 \times 1$ -inch

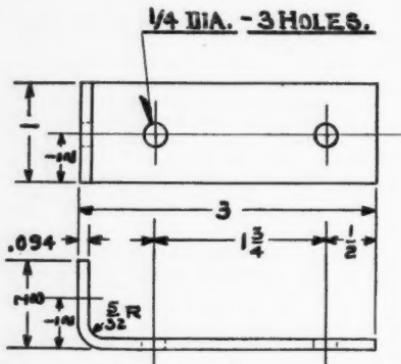


Fig. 1—Drawing of an L-bent blank of the type that is formed in the bender shown in Fig. 2.

steel strap and has three holes in it which were punched in the preceding operation. The bending die usually employed to make a bend of this kind is called an "L-type" bender. The construction of the L-type bender is quite similar to that of the "U" bender, with a few exceptions.

The stripper in an L-type bender is usually made a little longer than the length of the bent blank, so that the finished product will not be forced

into contact with the backing jaw as the material in process is entering the die. If this contact is allowed to take place when soft material is being processed, it may produce a knife edge on the blank as shown in Fig. 2. The knife edge is due both to the rubbing and to the final setting of the material; it cannot spread outward past the backing jaw, therefore any excess material in the blank will be forced up and in between the backing jaw and the radius on the bottom of the punch. The stripper is indicated at A, Fig. 3, and the backing jaw at C.

Figure 3 illustrates the correct construction of an L-type bender for producing the blank shown in Fig. 1. It may be noted that the right side of the punch B is made so as to be exactly 90 degrees from the base, and that the

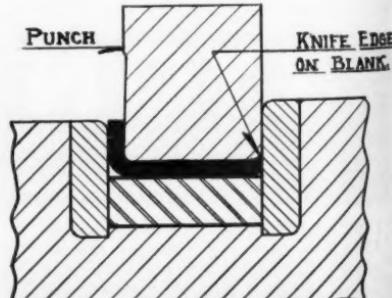


Fig. 2—Construction of the L bender.



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backing jaw is made  $\frac{1}{4}$  inch higher than the bending jaw D. Since the bending is done only on the one side, the bending punch would naturally be forced over towards the opposite side in the line of least resistance had it

grain running across it on a 45-degree angle, as shown by either of the two arrows on the drawing of the developed blank.

The direction of the material grain is quite an important factor in a bending operation of this kind. As all four sides are to be bent up, were the material strips cut either with or directly across the grain, two sides of the box would be bent up with the bend running along the direction off the grain. As explained in the fourth article of this series (January, 1935, issue MODERN MACHINE SHOP), such a condition would result in the blanks being cracked and therefore unfit for use unless the material had previously been annealed. As annealing the metal is not always advisable on account of the manufacturing cost, it is more economical to cut the metal on an angle. In this manner a four bends will partly cross the grain, thus eliminating the breakage hazard and assuring a perfect setting of the material.

In Fig. 5 the top and elevation views of the bender used to produce

Fig. 3—The knife edge formed on the blank due to wrong die construction is shown in this illustration.

not already been entered into the die and backed up by the backing jaw before any bending took place. The two pilots E are used to locate the blanks in the bender, and they also prevent the blanks from shifting sideways when the bending operation is started. In such cases, where there are no holes in the blank to locate by, end gauges must be provided for that purpose.

The blank shown in Fig. 4 is for a small box that is formed in a bender in one operation of the punch press. The box illustrated is made of  $\frac{1}{8}$ -inch thick sheet steel and the two long sides are folded in so that, when completed, the two ends will cover them. The blank is punched out in a previous operation in which a blanking die is used, and the material strip used should be cut so as to have the

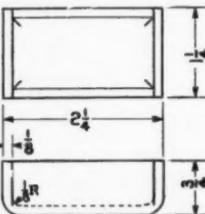
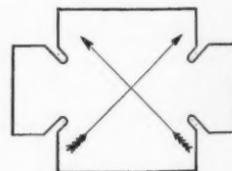


Fig. 4—Drawing illustrating development of a box blank.

the box illustrated in Fig. 4 are shown. In the top view, the upper or punch part of the die has been removed to bring the lower, or die part, into clear view. This type of a bender is somewhat more complicated than the L or



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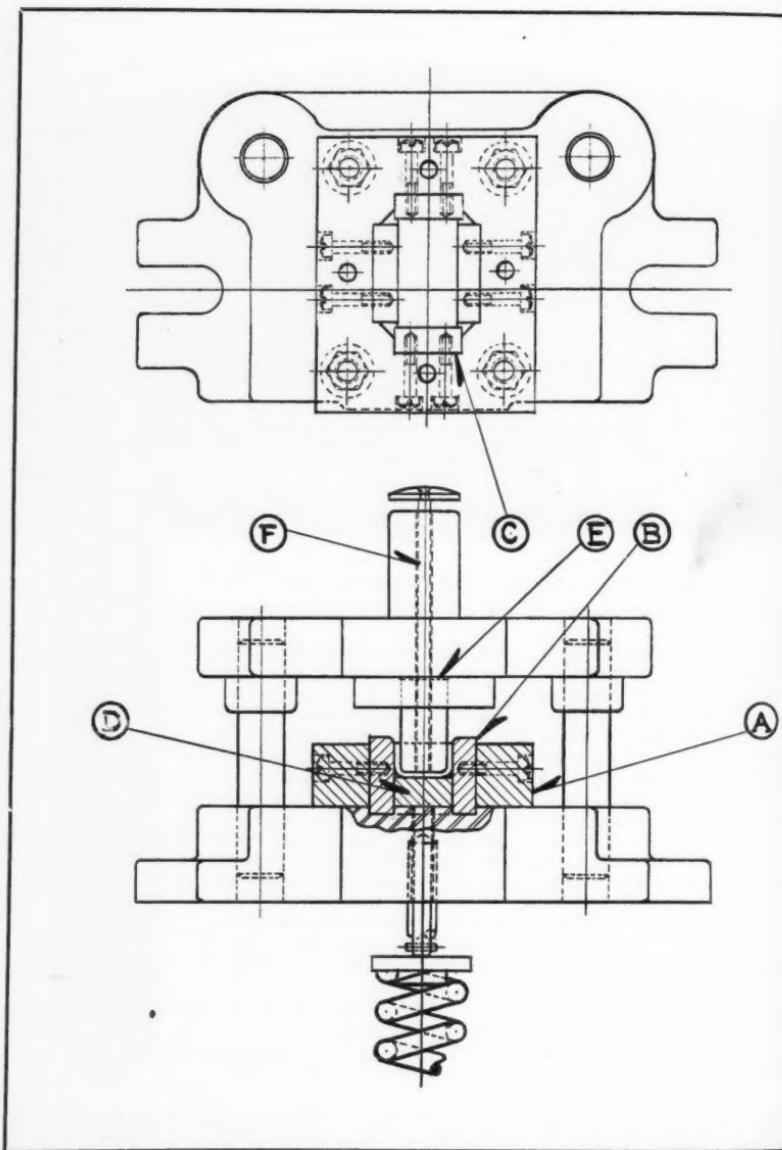


Fig. 5—Design of bender used to make the box shown in Fig. 4.

U type benders as, in this tool, two separate bending operations must be performed in one stroke of the press to bend up all four sides of the box.

The jaw holder A may be made of hot rolled steel and the center may be burned out, the holder then being machined to suit requirements so as to form a rectangular frame. The center of the frame is removed in order to allow the bending jaws to be located in position. This frame must be made strong enough to withstand the side and end pressures to which it is subjected during the bending operation.

The frame is anchored to the die shoe by the use of hex head machine bolts applied through the bottom of the die set, and is kept in alignment by means of at least one dowel pin on each side. In this die the dowel pins should be  $\frac{3}{8}$  inch in diameter and should be hardened to eliminate any chance of being sheared off through the outward pressure of the jaws during the bending operation. The two bending jaws B are of medium grade steel, hardened to 80-85 points sclerometer and ground so as to present a smooth bending surface. A predetermined radius must be ground on the top of all the bending jaws to facilitate the start of the bending operation. These jaws are held in position inside the bender frame with two  $5/16$  inch 18-thread filister head screws.

Since the jaws B are to form the sides of the box, they should be made to project about  $\frac{1}{4}$  inch higher than the two end jaws C, which form the ends of the box. It is readily seen that the sides of the box must be bent first in order that the ends may be bent up afterwards so as to cover the sides. It must also be noted that the die shoe is machined out to allow the bender jaws to be set in to a depth of  $\frac{1}{8}$  inch, as outlined in previous discussions of bending dies.

Sometimes this is not done, in which case a separate piece is made of cold rolled steel, machined to the correct size and placed down inside the jaws for the purpose of keeping them from

moving inward at the bottom. The reason this method is not always used is that the frame A must be made thicker to take care of the added piece. This extra piece also raises the die higher, and usually they are made as low as possible so that if it becomes necessary to use an extra bolster plate, the necessary die space will be available.

The design of the stripper D and the punch E may be exactly the same as those used in the U-bender. The usual spring assembly is fastened to the bottom of the bender shoe to lift the stripper so that the finished box may be ejected from the bender. The knocker pin F is used to strip the box off the punch on the up-stroke of the press. This knocker pin operates through the punch holder stem and through the punch and is actuated by a set knocker bar in the press ram.

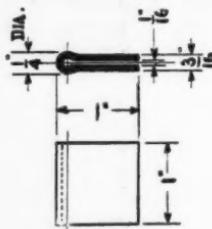
## Two Position Benders

Occasionally tools for two separate bending operations are placed in the same bender shoe. These benders should always be placed side by side, facing the punch press operator. Double benders should never be made so that one bender will be located behind the other; it forces the press operator to work over and past the first bender in order to both locate and remove the blanks from the second operation bender, which is a very dangerous method of procedure. Considering that the press operator might be injured or the dies damaged, the first method outlined is by far the best and safest to use.

In benders of this type each bending operation carries its own complete assembly except for the punch plate and the bender block, which items may be made large enough to take care of both punches and also the two sets of bending jaws. However, from past experience the writer has found it best to use a separate

punch plate and bender block for each operation.

From this information the reader can readily observe that, as regards the die building cost, the only real saving would be the price of one complete die set. This, however, is often offset by the fact that in combining the two operations, the two-position bender is more complicated to build and to adjust during the try-out period. Also, the production time of the completed blank is slightly slower



**BLANK**  
**MADE FROM  $\frac{1}{16}$ " THICK**  
**HALF-HARD SH. BRASS**

Fig. 6—Drawing of hinge clip which is to be made in the two-position bender shown in Fig. 7.

due to the time required to lift and shift each blank from one bending position to the other.

Another important fact to be remembered is that in case of repairs to one of the benders, the entire die is placed out of commission and all bending operations in which this die is used are stopped. However, since the two benders can be incorporated into one die shoe, thereby reducing the handling during transit and in setting the die, as well as economizing on storage space, many stamping plants are using these types of benders constantly in their regular production work.

Figure 6 illustrates a hinge strap that is made of 1/16-inch thick half hard sheet brass which is to be pro-

duced on the two-position bender shown in Fig. 7.

The bender shown in Fig. 7 is made entirely in the shop. The bottom plate A and the top punch holder B are made of hot rolled steel. These plates are first surface ground, then machined to size. Liner or guide pins may be provided or left off, depending on the custom of the stamping plant. Die sets having guide pins are, of course, the best, since they keep the bender in alignment at all times and speed up the setting of the bender in the punch press. There are cases when a home made die set is required, so for that reason this bender is shown mounted on such a die set.

The die stem Q is usually made of hot rolled steel and may be made 1 1/2 inches in diameter, so that the bender may be used in regular presses of 1 1/2 inch capacity. If the die is to be used in a press where the stem holder is of 2-inch capacity, a split bushing may be placed around the 1 1/2-inch stem, making it adaptable for the larger press. These stems are turned down to 1 1/4-inch diameter at the bottom and a special 12-pitch thread is provided to screw into the punch holder B. The stem is then locked in place by the headless set screw P for which a hole is drilled and tapped after assembling the stem and holder so that half of the screw is in each part.

The punch holder plate C is made of cold rolled steel to eliminate extra grinding on the top and the bottom. This plate is machined out to carry both punches I and J. The bender blocks D and E are of hot rolled steel and are machined up to the required size to hold the bender jaws. These blocks are fastened to the die shoe with two  $\frac{3}{8} \times 16$ -thread hexagon head machine bolts and two  $\frac{5}{16}$ -inch diameter dowels.

The two jaws F are alike and

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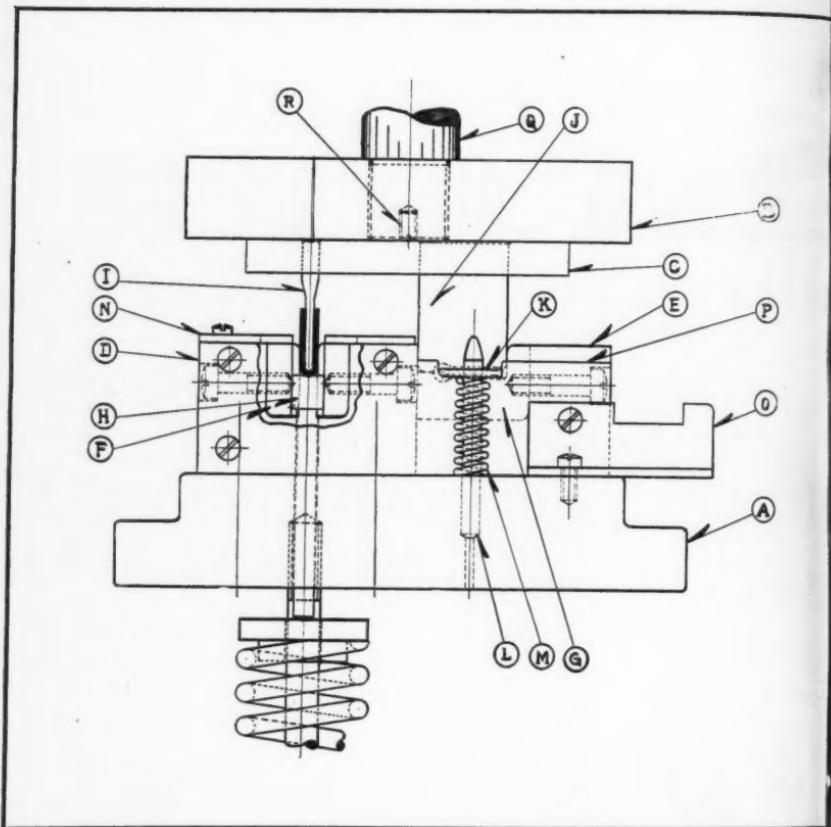


Fig. 7—Design of two-position bender used to form the clip shown in Fig. 6.

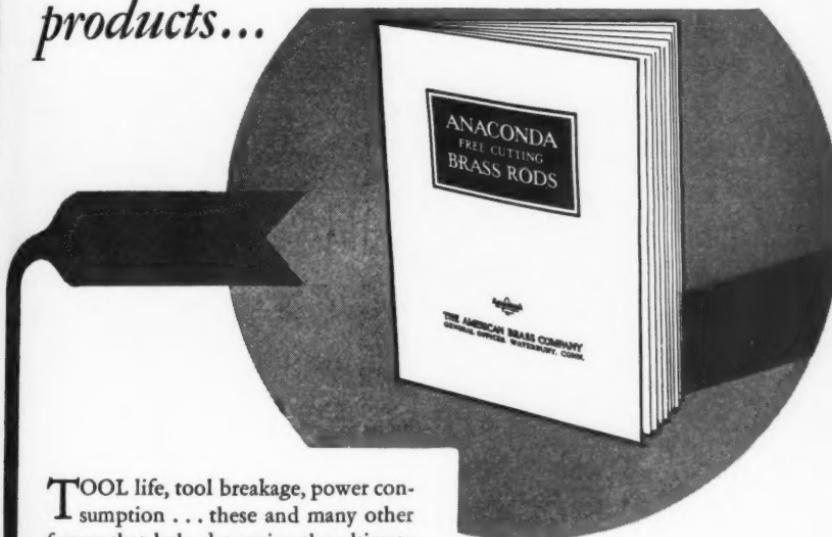
made as shown in Fig. 8. They must be machined out to allow the enlarged ends of the stripper **H** to come in between them. The stripper in this case had to be made to this special shape so that the stripper pins could be set in place. Since the bent blank in the first position bender is so narrow, and the stripper must be made to the same width through the section in the center where the bending takes place, this is the only practical method for building the stripper. Otherwise the stripper pins would have to be made so small that they would

not stand up. The stripper **H** is hardened and has a small round groove ground in it for setting and holding the blank material at the beginning of the bending operation.

The two locating gauges **N** are of cold rolled steel, case hardened. They are fastened to the top of the bender block **D** with one  $\frac{1}{4} \times 20$ -thread filister head screw and kept from moving by two  $\frac{1}{4}$ -inch dowels.

The blank is bent to shape in the first operation, then it is removed from the bender with special tonge provided for that purpose (safety re-

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quirements) and is placed on the mandrel K. This mandrel is of tool steel, hardened and ground to shape to fit the inside of the blank. The

PINS RIVETED OVER.

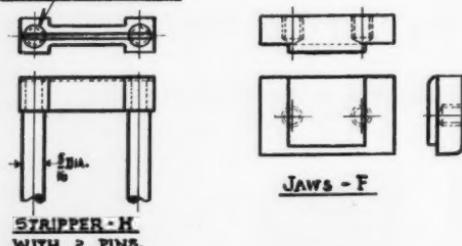


Fig. 8—Drawing of the bending Jaws F and the stripper H as machined to suit the requirements of the two-place bender shown in Fig. 7.

mandrel is made some four inches longer than the width of the bender block so as to form a handle. A hole is drilled in the handle part so that it can be slipped over the locating pin L, around which the compression spring M is wound. The spring is

used to force the mandrel up until the second bending operation punch comes down and contacts the blank when it is pushed down and the work is formed to the finished shape.

The guard P is in this case made of  $\frac{1}{8}$ -inch sheet steel, running the entire length of the two die blocks and fastened to them with four  $\frac{1}{4} \times 20$ -thread filister head screws. This guard is cut out to clear the mandrel all around on the second operation bender.

The blank remover O is of  $\frac{1}{4}$ -inch cold rolled steel and is fastened both to the die block E and the die shoe A with two  $\frac{1}{4} \times 20$ -thread filister head screws. After the second bend has been completed, the mandrel is lifted from the die, placed over the blank remover in the slot cut for it, and then pulled forward, thus removing the finished blank from the press.

## A Concise Report for the Chief Executive

BY CHANDLER C. JORDAN

THE chief executive in a modern manufacturing plant must necessarily, if he is to be successful, control a wide variety of functions involving a mass of detail. It is readily apparent that the more this detail can be boiled down, the more readily it can be absorbed and the more promptly and accurately will the chief be able to make his decisions.

These details include such data as figures on sales, production, shipments, and finances, and where the volume of business transacted is variable, a report should be rendered

daily. If the volume is steady and the variety is limited, it may be that a weekly report on some of the items is sufficient. The point is to segregate the figures that are significant.

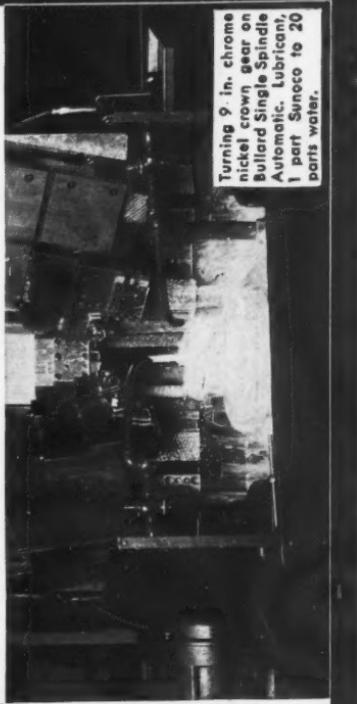
The form shown herewith is one that is being used by the general manager of a large and well-known plant. This report is made out daily from information supplied by the sales, accounting, and production divisions. Weekly copies are compiled and sent to those members of the board of directors who are on the important committees such as the finance committee, production committee, and

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February, 1939

February.

**Form 1—Executive's Report, Giving Details of Sales and Shipments.**

so on. The report is itemized as to the various types and sizes of products, sub-totals being shown for each class of product with a grand total for the entire sheet.

One of the two major divisions of the form is headed "Sales" and is divided into two columns one of which is for "Quantity" and the other for "Value." Each of the two columns is then subdivided into sub-columns headed "Today," "This Month," and "This Year." In each of these columns the figures properly applying are entered, such as the quantities for the month, day, and year, and the value of the quantities for each of these periods. The monthly and yearly columns are cumulative.

The second major division is headed "Shipments", and it, in turn, is divided and posted in the same manner as that headed "Sales."

On the reverse side of the sheet are spaces for financial value such as deposits, withdrawals, and balances for each bank with which an account is carried, and also the totals. Space is provided for the value of the current assets and liabilities, such as accounts and notes receivable and accounts and notes payable.

From this report a weekly graphic chart is made up from the data regarding finances, showing the accounts and notes receivable, the accounts and notes payable, the total cash in bank, and monthly line showing the portion of accounts receivable which is past due.

Another graphic report is made of the production, sales, and shipments of each class of products.

The first column contains the name and size of the article. The next column is headed "Produc-

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<b>Balance Today</b>					
<b>Acct. Receivable</b>					
<b>Notes Receivable</b>					
<b>Total</b>					
<b>Acct. Payable</b>					
<b>Notes Payable</b>					
<b>Total</b>					
<b>Difference</b>					

Form II—Reverse Side of Executive's Report.

tion" and in this column are posted the daily quantities of the various products or parts that are received in the "Finished Stores" department.

By watching the graph of the financial data, the treasurer is enabled to

keep a close touch on his accounting and collection department, while the general manager is supplied with valuable information as to the activities of his manufacturing and sales organizations.

**GORHAM GROUND TOOL BITS AND TURNING TOOLS.** Tool buyers will be interested in this six-page folder which gives full details concerning the tool bits and turning tools now being marketed by Gorham Tool Company, 14400 Woodrow Wilson Avenue, Detroit, Mich.

To cover the general tool bit field, this company has developed three distinctive cutting materials for tool bits and turning tools; Gorham Standard for the commercial field, Gorham Imperial for heavy cuts in hard material and Gourmet for the more abrasive materials. The folder describes the application of these three different types of tool bits, tabulates the sizes, and gives prices. A copy of the folder can be had by addressing the above company.

**COATED ABRASIVE MATERIALS:** Users of coated abrasive materials will be interested in this 20-page booklet, which gives an interesting history of the origin of the different kinds of abrasives in use today. Each type of abrasive—sand paper, emery, silicon carbide, aluminous oxide, and so on—is described, its chief uses and advantages brought out, and characteristics outlined. The booklet closes with an 8-page description of a trip through a plant in which coated abrasive materials are manufactured. A copy of the booklet will be sent to any mechanical executive or engineer who will address his request to the Clover Manufacturing Co., Norwalk, Conn.

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## IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

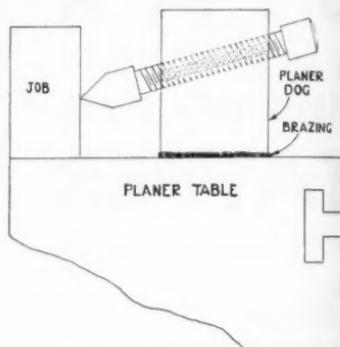
### Save the Machine Tables

BY PAUL C. BRUHL

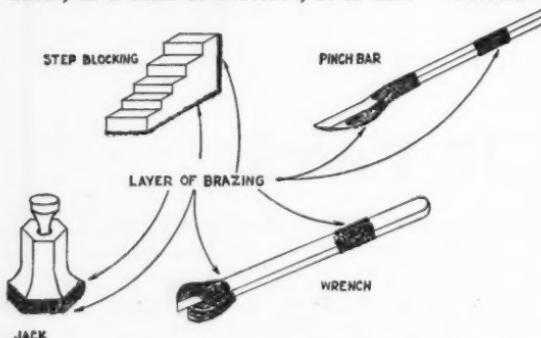
ONE of the most common—and least excusable—characteristics of the careless mechanic is the tendency to drop wrenches or other tools on the machine tables, causing pits, dents, and scratches in the tables. The type of operator who is guilty of such indifference also neglects to place pieces of sheet brass or fibre under the jacks or blocking when setting up jobs on milling machines or planers.

In a large plant in Detroit it was found that the carelessness referred to above made it necessary to refinish the machine tables at frequent intervals, which was not only expensive, but weakened the tables. Reprimanding the operators produced no results; if a man is careless, it is diffi-

faces and edges of all wrenches and other machine accessories be provided with "guards" of soft metal, to be



Showing application of brazing to planer dog.



Machine accessories with contact surfaces brazed to save the machine tables.

cult to make him careful overnight. Another solution was necessary.

It was then suggested that the flat

applied by brazing. Accordingly, the bottom surfaces of jacks and steel blocking were reinforced with spelter and the same was applied to the flat surfaces and corners of wrenches, inch bars, and other tools. By brazing the contact points of these tools, not only were the machine tables preserved, but the use of brass and fibre shims under the jacks and blocking was entirely eliminated. The brazing operation is both comparatively simple and inexpensive, and the spelter can be applied by the plant maintenance department. This protection to the machine tables will pay for itself many times over.

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## Mechanism Which Disengages Overloaded Rotary Member

By J. E. FENNO

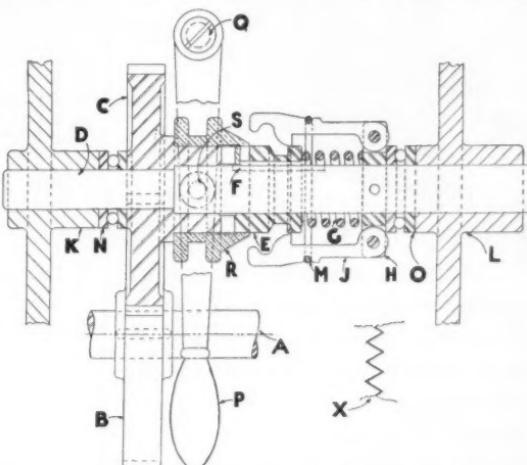
**I**N A PLANT manufacturing centrifugal pumps, the operation of packing demountable stuffing boxes is performed on a machine designed for this purpose. According to the specifications, this packing must be inserted in the boxes with a ram pressure not exceeding a predetermined amount. In order that this pressure will be just as required and not exceeded, the overload relief clutch shown in the illustration was incorporated into the design of the machine. It is arranged so that when the desired pressure is developed, the clutch automatically disengages the power and thus releases the pressure on packing.

The driving shaft for actuating the ram (not shown) is indicated at A. To this shaft is keyed the gear B which meshes with gear C. The gear C is free to turn on which is supported in the stationary bearings K and L. The hub of this gear, however, is provided with clutch teeth that engage similar teeth in the clutch member E. The contour of these teeth is shown in the detail view X. Member E can slide along shaft D, but is prevented from rotating on this shaft by the key F.

Thus the teeth of member E are engaged with those of gear C and gear C is locked to shaft D by the coil spring G, which is backed up by a collar H that is pinned to the shaft. Two fingers J pivoted to this collar are held against the flange on the

clutch member E by means of the spring ring M. Owing to the axial pressure imparted by the coil spring, ball thrust bearings N and O are provided to take the resulting end thrust.

When the ram has developed the required pressure in the packing, any additional pressure will cause the teeth on members C and E to slide one upon the other and push member E toward the right, against the tension of the coil spring, until it is disengaged from



Drawing Showing Design of Mechanism Which Disengages Overloaded Rotary Member

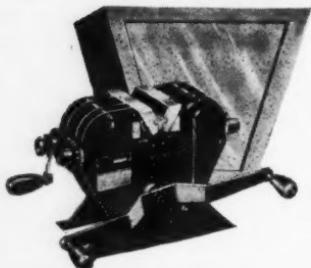
shaft D member C. At this point fingers J are forced inward by ring M until they hook over the flange of clutch member E. In this way the power for operating the ram is disconnected so that the ram pressure is released.

The ram is then elevated by a hand lever and rack arrangement (not shown) and the box is removed and replaced with another by the operator. To connect the power again to operate the ram, the hand lever P, fulcrumed at point Q, is swung toward the right. Pin S in lever P engages the groove in the sliding sleeve R so that the action of moving lever P toward the right also moves the sleeve

February, 1933

February

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# Clipper Lacing Equipment



in that direction, causing its tapered end to engage the ends of fingers J, lifting the latter and releasing the clutch member E. This allows the member E to be forced toward the left by spring G and into engagement with the teeth on gear C, thus connecting the power to the ram.

The engaging surfaces of the fingers with respect to the clutch member E are at a suitable angle to provide a wedging action between these members when the clutch is in its disengaged position. In this way, although the points of the teeth on gear C and member E graze each other when disengaged, no troublesome interference results.

## An Economical Bending Fixture

BY PETER L. BUDWITZ

**J**OB shops are often confronted with the necessity of making small quantities of parts which must be

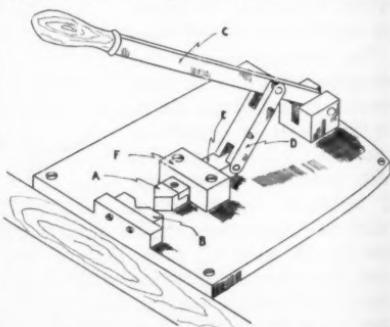


Fig. 1—Economical bending fixture for small lots.

fashioned from sheet or strip stock, and not always is there a press available for the job. Or if one is available, it may be too heavy for economical operation. The hand bending fixture shown in the illustration was designed by the writer to meet the requirements of small lot and experimental bending and folding. Since

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S. S. WHITE also offers a wide selection of shapes and sizes of small cutting and grinding tools—fast, clean-cutting tools that last a long time because of their fine quality and accurate construction. TRY THEM.

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the forming units A and B are of simple construction and are detachable, the fixture can quickly be adapted for a variety of jobs without end-

other work in which strip stock is used can be processed without difficulty. There is also ample space for attaching various kinds of locating devices or gauges to suit the work in hand.

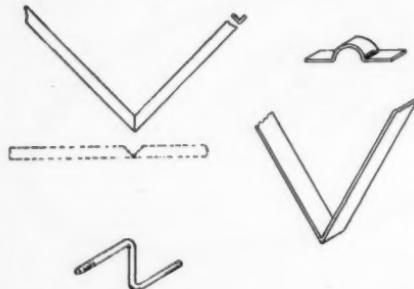


Fig. 2—Examples of work that can be formed with the bench bending fixture.

tailing the expense of more complicated press tools.

In order to obtain the maximum of leverage, the fixture is designed upon the toggle principle. Power is applied by means of the hand lever C, which is connected to the ram E by the link D. The entire mechanism is mounted on a cast iron plate which is anchored to the work-bench with screws. The ram E is retained and guided by the block F, which is bolted to the plate. The die member B is backed by a rib cast on the end of the plate, as shown. All pins used in the toggle mechanism are hardened to prevent premature wear.

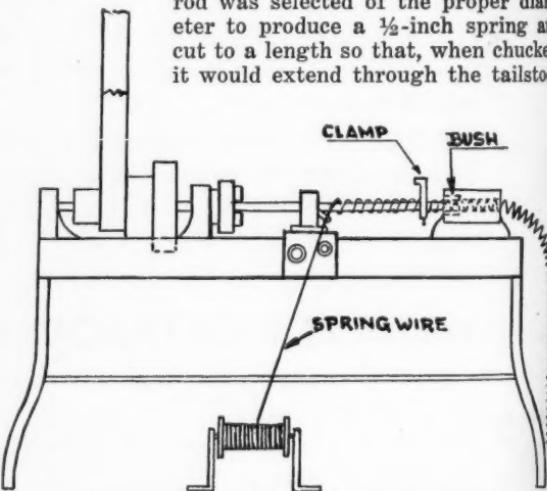
Figure 2 shows a few examples of the various types of operations that can be performed in the fixture. Because of the free space that is available about the working portion of the device, large-size frames and

## Making 100-Inch Springs

BY HAROLD C. ROSE

**R**ECENTLY we had occasion to make up some springs that were to be  $\frac{1}{2}$ -inch diameter by 100 inches long, but when we attempted to make them by the usual method of winding them on an arbor, we found that no lathe was available that would take an arbor of that length. However, we made the springs, using the following method.

The tailstock screw and spindle were removed from an engine lathe, then a bushing was made to fit the spindle hole in the tailstock, the hole in the bushing being 1-16 inch larger than the diameter of the spring. A rod was selected of the proper diameter to produce a  $\frac{1}{2}$ -inch spring and cut to a length so that, when chucked, it would extend through the tailstock



With this equipment, springs of any length can be made.

bushing as shown in the illustration.

The end of the wire was clamped to the rod at a point near the tail-

Do you know . . .

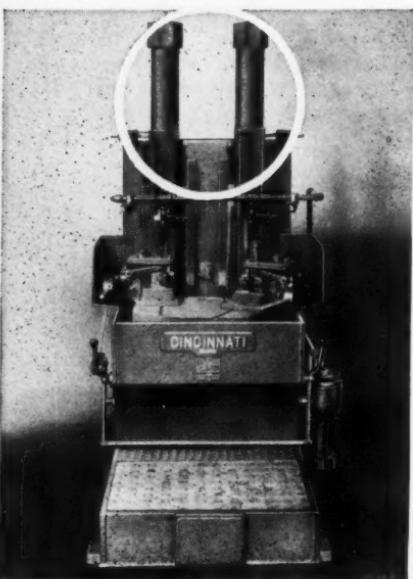
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It is significant that American Hollow Boring Cylinders were chosen for equipment on the New Cincinnati Hydro-Broach, illustrated above, built by The Cincinnati Milling Machine Co., Cincinnati, Ohio. Many leading machine tool builders rely on American Hollow Bored spindles, shafts, cylinders, rams, clutches, etc. . . . they are sure of high quality products and quick service.

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HOLLOW BORING CO.**

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ERIE, PENNA.

stock, a lathe dog being used as a clamp, and the lathe was run backward with the wire feeding through a hole in a guide which was held in the toolpost in the usual manner. With the change gears set to operate the lead screw at the correct number of revolutions per inch of tool travel, and in threading, the wire was wound as far as the tool could travel in the direction of the headstock. Then the dog was loosened, the spring was pushed out through the bushing in the tailstock, the dog was clamped again, and the operation was repeated.

By operating in the manner described, a spring of any length can be made.

## Facing Flanges on Out-Of-Round Pipe

BY C. R. EVANS

AMONG the jobs that came into our shop was one consisting of a number of pieces of 2-inch cast iron pipe with flanges cast on the ends of each piece. The order specified that the flanges were to be faced but the pipe sections were so badly out of round that it was impossible to use a steady-rest. Using a bell center didn't help much, because the flanges couldn't be faced clean, and the use of a spider small enough to enter a 2-inch hole would slow down the job too much. I finally designed the arrangement shown in the drawing and the job was completed satisfactorily.

The part A is a nut for the screw B, and the part C is a split bushing in one end of which a "V" is milled as shown. The diameter of the bushing is such that it will easily slip into the end of the pipe. The nut A is turned to the outside diameter of the bushing, then milled on opposite sides to fit the V. One end of the screw B is threaded to fit the nut and the other end is made with a tapered sec-

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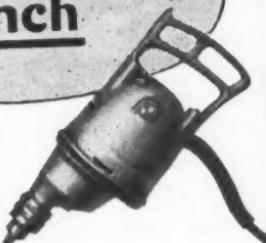
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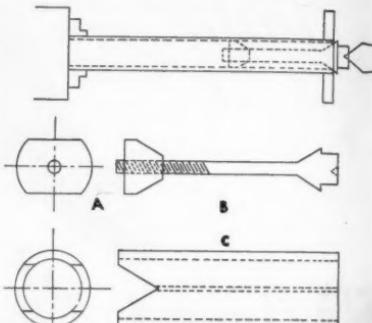
A Hammer  
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tion, the large diameter of which is slightly larger than the hole in the pipe. This end also carries a projection that is milled flat on opposite sides to take a wrench, and has a center hole in the end.

To use, the screw, carrying the nut is placed between the halves of the bushing with the taper on the screw projecting at one end and the large end of the nut projecting at the other. Then the device is slipped into the



Drawing showing device used to hold ends of out-of-round pipe so that the flange can be faced.

end of the pipe with the flat part projecting so that it can be gripped with a wrench. When the screw is revolved, the nut is drawn into the bushing, expanding it tightly against the inside of the pipe. This end of the piece can then be held on the tailstock center for facing, the opposite end being gripped in the chuck. The use of this device made it possible to machine several hundred pieces without difficulty.

### Centralizing the Keyway Cutter

BY CHARLES KUGLER

WHEN a vertical shaper or slotter is used to cut a keyway in work that is held to very close limits it is usually a difficult matter to set

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**CLASS 2510 W10**  
**A. C. MANUAL STARTER**  
 Push Button Operation. Overload Protection by Thermal Relays. Polyphase Ratings 5 H. P., 220 Volts; 7½ H. P., 440-550 Volts. Standard Enclosure. Price \$9.00.

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**5 H. P. motor . . .**

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What were your electric repair bills last year? What production time was lost by shut-down? Why continue the expense this year?

The Class 2510, Square D, manual A. C. motor starter gives overload protection by thermal relays. When an overload occurs the

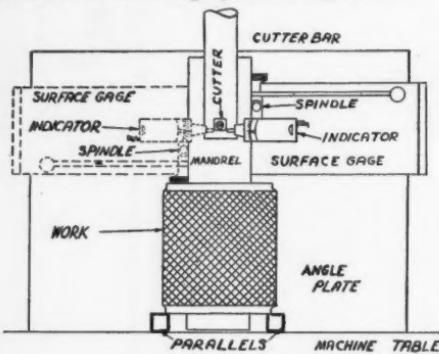
relays trip and stop the motor. After the overload is removed the relays are reset by pressing the stop button. No replacement parts are required. Let us tell you more about push button control and overload protection. A post card will bring you the information.



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the cutter central before taking the finishing cut. However, the method outlined here is simple, and has proved



Drawing illustrating method of centralizing cutter for slotting a keyway.

satisfactory in practice. It has the added advantage that the inspector can check the work with the same

tools that were used by the toolmaker to perform the operation.

The work-piece shown in the drawing is a gage in which a keyway is to be cut. The gage is slipped over a mandrel, which must be a good fit in the hole, then parallels are used to block the gage up so that the lower end of the mandrel clears the table. An angle plate is set on the machine table, parallel to the line of motion of the machine, and the cutter bar is lowered so that the cutter is slightly above the top of the gage.

A surface gage is now held against the vertical side of the angle plate with the gage spindle, upon which the indicator is carried, in contact with the side of the mandrel and with the indicator plunger in contact with the side of the cutter. The reading should be the same when the indicator is held



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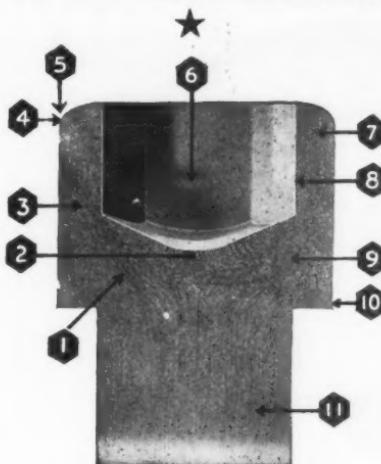
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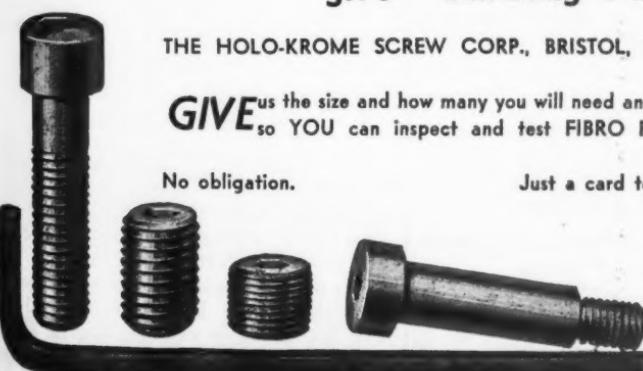
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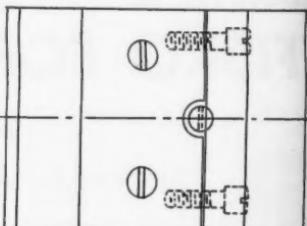
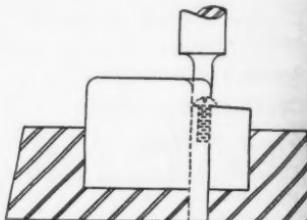
on either side; if it is not, the machine-table is adjusted until it is.

With the work-piece clamped in position, the mandrel is removed and the cut proceeds. If 0.005 inch is left on a side for the finishing cut and the cutter is centralized by the method described, the work will pass the inspector without any trouble.

### A Simple Shearing Die: A Comment

BY WM. C. BETZ

**T**HE die for shearing screw heads, described by Charles H. Willey in the November issue of MODERN MACHINE SHOP, seems to me to be



**A Simple Shearing Die**

rather elaborate for the job for which it is intended.

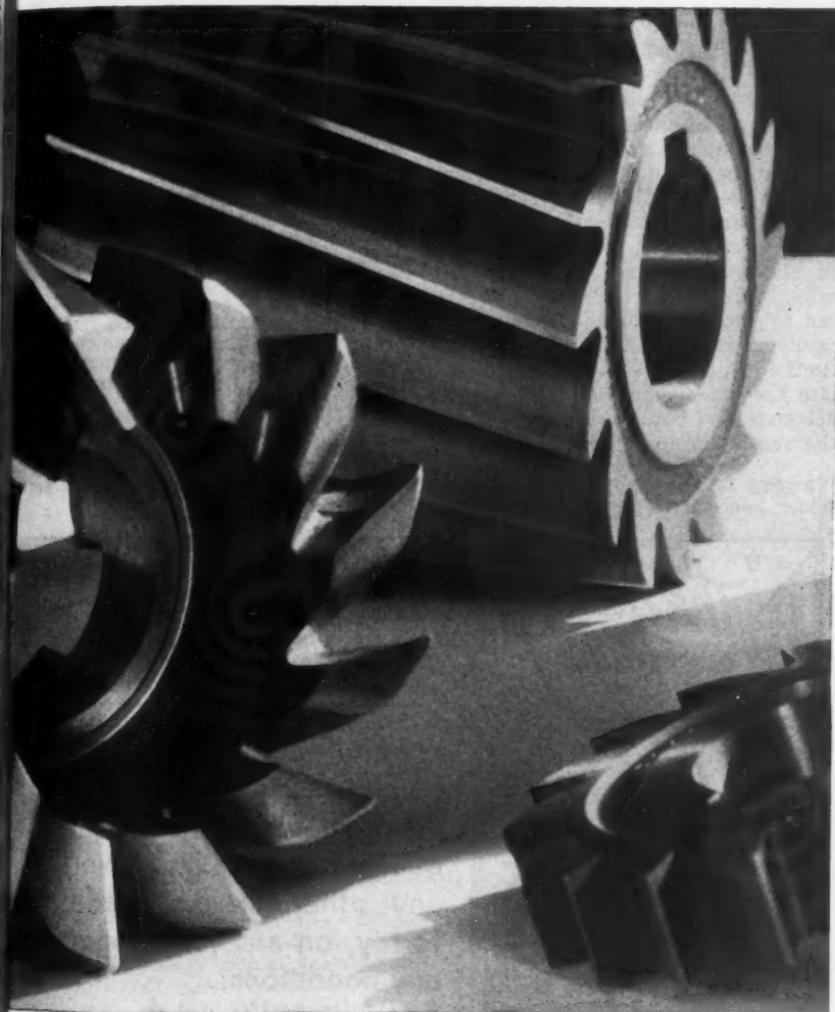
I should think that the pinching action of the cutters would leave a considerable amount of fin on the edge of the screw heads and it appears to me that the removal of the blanks after cutting was a slow, if not tedious, operation due to the fact that the heads would have a ten-

ry, 1935

February, 1935

MODERN MACHINE SHOP 57

# BARBER-COLMAN CUTTERS



MANUFACTURED BY BARBER-COLMAN COMPANY, ROCKFORD, ILLINOIS, U. S. A.

# BARBER-COLMAN CUTTERS

dency to stick in the lower half of the die.

The drawing herewith shows the design of a die which I think Mr. Willey will agree would be much cheaper to make. It would also do a much better job because the head would be sheared off clean and there would be no labor in connection with the removal of the screw. The screw would be pushed on through the die.

It will be noted that the receiving, or back piece, of the die is somewhat higher than the front, or cutting edge. This construction provides backing for the punch and also for the screw head. The punch is rounded on the end to the shape of the screw head, resulting in a clean shear. To operate the die, the screw blank is dropped into the die opening, then the punch descends and both shears and pushes the screw through the die.

**POTTS JJ SOFT STEEL.** This 4-page folder, issued by the Horace T. Potts Co.,

East Erie Ave. and D St., Philadelphia Pa., gives the analysis of Potts JJ Soft Steel, physical properties heat treated and untreated, describes the forging, welding, bending and machining characteristics, and gives directions for carburizing. Copies gratis.

### Baldwin-Duckworth Chain and Sprocket Handbook K-1

Power engineers, conveyor engineers, draftsmen, and millwrights will find a fund of valuable information regarding power transmission and conveyor equipment in the new Catalog K-1, now being distributed by Baldwin-Duckworth Chain Corporation, 367 Plainfield St., Springfield, Mass.

Every possible power or conveyor problem has been anticipated and the answer incorporated in the text of the book. Data includes information and tables as to the correct chain to use for a wide range of horsepower and speed conditions, types and sizes of sprockets, and so on.

A copy of the catalog is available to any mechanical engineer or executive upon request.

"The Blade in the Plaid Box"

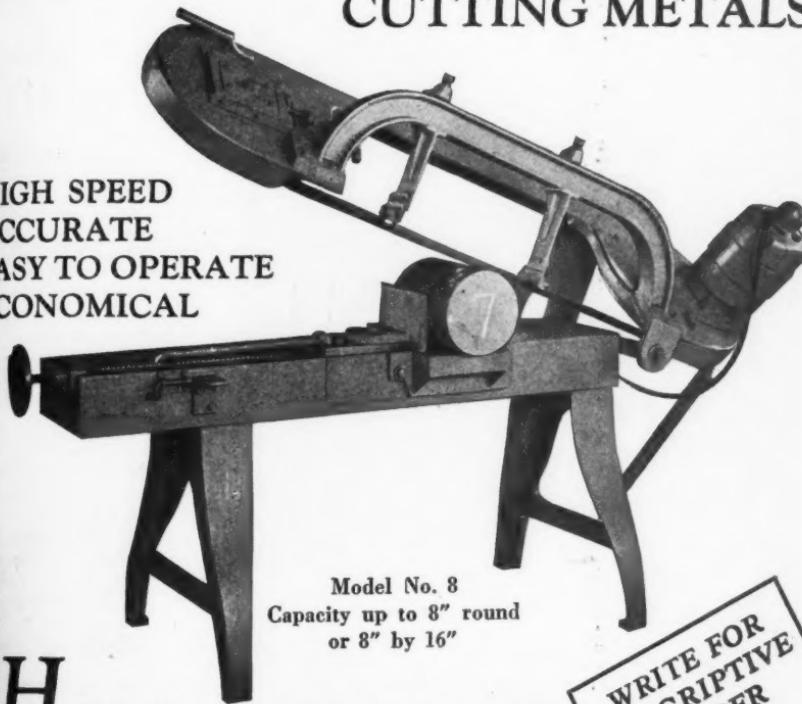
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Model No. 8  
Capacity up to 8" round  
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February, 1954



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**NORTON COMPANY**  
WORCESTER, MASS.





## Over the Editor's Desk

### Organization Spirit

THE Allis-Chalmers Manufacturing Company, one of the largest firms engaged in metal manufacturing, held open house a couple of weeks ago for some 30,000 guests. Entrance during the morning was reserved for the 18,000 employees of the firm and their families, and probably for the first time in the many years that some of those men had been employed by that firm, the wives and mothers and children had an opportunity to see the inside of the building in which their men-folk spend their days.

Only a couple of months ago The Cincinnati Milling Machine Company did the same thing, and there have recently been others.

Such a gesture is to be commended. The men who comprise the manufacturing organization of such a firm spend more of their waking hours in the plant than they spend in their homes. As long as they are identified with that firm, their lives are bound up inseparably with its progress; they succeed as the firm succeeds and fail as it fails.

The expert workman is proud of his tools and the speed and accuracy with which he can accomplish the tasks in which they are used. He is proud of the machine over which he has charge, and if the tool is of a modern type he takes pleasure in demonstrating its many advantages. He takes a very definite pride in seeing the shop well filled with work in process, indicating to him the prestige of his firm in its industry. He takes a pardonable pride in explaining to his wife and family the intricate processes by which the rough castings and forgings and bars of metal are converted into finished mechanisms, and in setting forth the importance of his own task in the fabrication of those mechanisms.

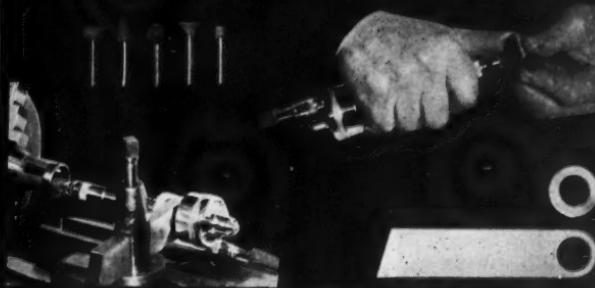
To the family whose knowledge of the "job" upon which the family welfare depends has mostly been gleaned from casual conversation, such a trip is of extraordinary interest. When the husband discusses at home the trials and successes incidental to his work, his helpmate takes a new interest in his conversation because she knows something, at least, of what he is talking about.

If they have growing sons who are looking forward to taking their places by their father's side, the mother has some idea of what is in store for them.

The most important net result is the development of a spirit of family loyalty. Every honest employer likes to feel that his employees have a definite attachment for the firm of which they are a part, and every right-minded workman likes to feel that his employer takes a personal interest in him and his family. This is as it should be. And there is no better way for an employer to build up organization spirit than to invite the families of his men to come into the plant and see the marvelous machines and equipment of which they undoubtedly hear so often at home.

Instead of vague impressions, the feminine member of the family will thereafter have a definite idea regarding the plant and the conditions under which her husband labors for the daily bread. Thus will be laid a foundation of understanding upon which may be built a structure of attachment and loyalty that will be of inestimable value. In many cases the opinion of the wife is an important factor in decisions concerning the husband's attitude toward his employer, and at such times whatever feeling of family loyalty exists cannot be discounted. The custom of holding "open house" periodically is one that could well be adopted in most manufacturing plants.

# JOHANSON PNEUMATIC *hand* GRINDER



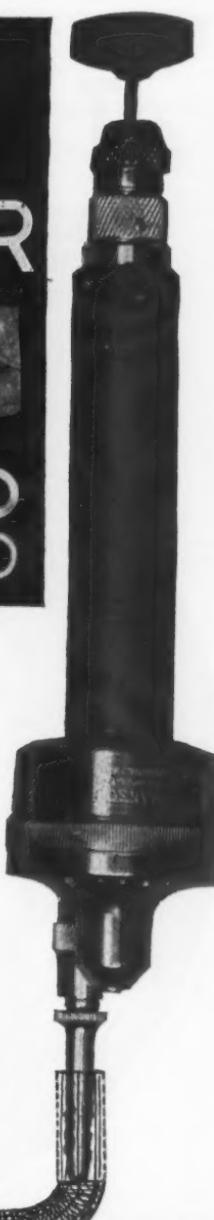
## 75000 R·P·M.

### EXCLUSIVE FEATURES

1. Most powerful hand grinder for its size and weight on market.
2. Adaptable to LATHE work—with furnished attachment.
3. No temperature rise under continuous operation.
4. FLEXIBILITY—"Hand-fit" design not hampered by shafting and motors.
5. LOW COST—Complete unit with air filter.....

**\$39.50**

**JOHANSON TOOL CORP.**  
20 PALMER ST. CAMBRIDGE, MASS.



# IT PAYS



**THE PIECE-WORKERS  
TO AVOID DELAYS  
•  
-SO THEY CHOOSE  
MORSE TOOLS**

Piece-workers go about the business of selecting tools with the ultimate personal savings in mind. They want tools that have an appetite for long hours of uninterrupted production—not tools that lose their sharpness early or call frequent halts in the work.

Morse Tools have won the piece-workers choice because of their ability to absorb extra long stretches of production work. Morse tempering, steel selection, and precision all play a part in making Morse Tools lower the cost and raise the speed of production.

- A conveniently located
- Morse Distributor will
- give you prompt service

**MORSE**  
TWIST DRILL & MACHINE COMPANY  
NEW BEDFORD - - - MASS., U.S.A.



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22 LAFAYETTE ST.

CHICAGO STORE  
570 WEST RANDOLPH ST.

## NEW SHOP EQUIPMENT

### Morton 12-In. Stroke High Duty Draw-Cut Flash Trimming Machine

The illustration shows the Morton High Duty Draw-Cut Flash Trimming Machine which has been especially designed by Morton Manufacturing Company, Muskegon Heights, Michigan, for removing the flash from butt welded steel rings such as automobile wheel rims. It is designed to take a width of seam up to 12 inches and stock thickness from 24 gauge to  $\frac{3}{16}$  inch. The machine is powered by an electric motor driving a hydraulic pump, and has a variable and return speed from 0 to 65 feet per minute.

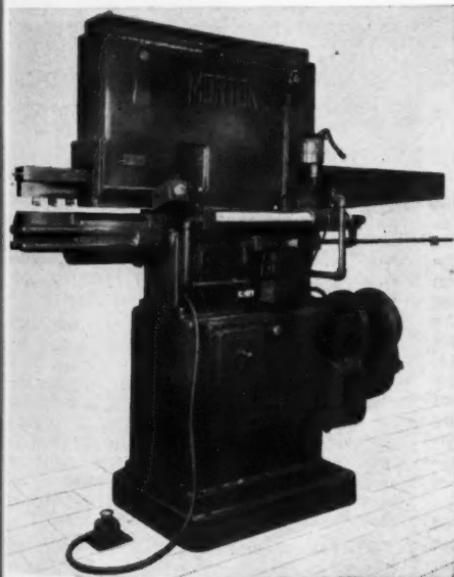
The power is applied to two reciprocating rams by means of hydraulically-operated cylinders. The work is placed between hardened dies, and sufficient pressure is applied through a hydraulically-operated spring-loaded toggle motion to securely clamp the work while the

work is in process of being trimmed.

The Morton feature of vertically-adjustable ram and dies is employed, which automatically takes care of the clamping and positioning of the cutters in relation to the work. It automatically compensates for any variation in thickness of stock.

The upper ram raises 2 inches, providing sufficient clearance for entering and removing the work. The cycle of operation is automatic. As the work is entered; the operator steps on the button, the machine automatically clamps the work and starts cutting on the draw-cut stroke. At the end of the stroke the work is released and the cutting tools return to "out" position.

The distance from the clamping die to the floor is 55 inches, but this dimension may be varied to suit operation requirements. Morton patented adjustable tool holders and tool set-up are employed, assuring rapid interchangeability of tools, long tool life, and maximum production.



Morton 12-In. Stroke High Duty Draw-Cut Flash Trimming Machine

### Rivet Enclosed Head Lathe

Rivett Lathe & Grinder Corporation, Brighton, Boston, Mass., has brought out an enclosed head lathe with a number of features intended to adapt the machine for high production with the maximum of operating convenience. The enclosed head with hinged cover gives access to the cone pulley for holding or revolving the spindle when indexing, measuring or locating work, and the removable end plate permits convenient replacement of the endless cone belt.

Super-precision tapered roller bearings are provided with easy take-up to compensate for possible wear. The machine is available with either hand lever control as shown in the illustration or two-latch foot treadle control for selective high and low range speeds. With a constant speed motor ( $\frac{3}{4}$  h.p. recommended) the unit is offered for 6, 12, or 18 selective forward or reverse speeds in well-

graded steps from 200 to 3,000 r.p.m.

Without involving shift of the motor V-belt on the steps of the driving sheave, the standard low range is 200, 285, 420, 600, 850 and 1250 r.p.m., the higher ranges being accorded as specified by the user to provide efficiency for small diameter work when using modern cutting tools of the tungsten carbide or diamond type. At a touch of the hand or body of the operator, the speed box lever disengages from its high or low speed range position and flies to neutral, the automatic brake simultaneously and instantly stopping the driving cone pulley without involving stopping of the motor, which runs continuously.

The speed box is equipped with Timken tapered roller bearings and employs helical, fabric and cast iron gearing constantly in mesh. The clutch is the multiple steel disc double-throw type, all-splash lubricated.

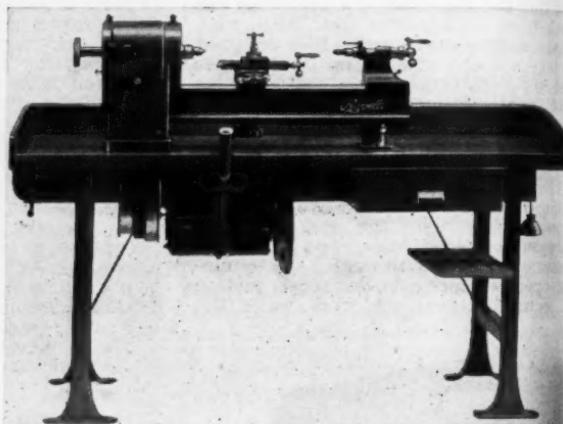
The length of the lathe bed is 38 inches, and the distance between centers is 17 inches. Swing over the bed diameter is 8 inches. Capacity through collet and draw spindle, 1 inch. Spindle speeds, 6 reverse or 12 forward and 18 reverse.

To permit the replacement of the flat endless belt driving the spindle, a removable plate at the left end of the lathe is provided. A "U" slot in the bench permits passing the belt through the bench, and the driving pulley below is overhung to allow application of the belt without removal of any parts. By opening the hinged cover in the head, access is had to 60 index holes in the flange of the cone pulley, any one of which can be engaged by an indexing pin at the left end of the head. A separate locking pin engages the ten locking pin holes in the right flange of the cone pulley.

The hardened, ground, and lapped steel headstock spindle is of 1-inch collet capacity and may be specified with either tapered or threaded nose for mounting attachments. The tapered roller spindle bearings are opposed to take end thrust

and can be adjusted. The draw-in spindle of the headstock is equipped with a knurled hand wheel which is also provided with holes for a spanner wrench. An automatic lever chuck-closer can be provided.

The bed is in heavy box section with hand scraped bevel edged guideways and is supported on pedestals affording screw adjustment for parallel raising and lowering the lathe for proper tensioning of the headstock spindle cone driving belt. Into a spherical depression in the top



Rivett Enclosed Head Lathe

of the right pedestal is fitted a spherical washer which carries the bed, the bed at the left pedestal being fitted with two steel balls bearing on the pedestal head in transverse line with the head. This three-point mounting is designed to protect the bed from distortion strains.

The motor drive consists of a standard  $\frac{3}{4}$ -h.p. 1750 r.p.m. constant speed reversible motor carried on a swing plate mounted on cork insulation for absorption of vibration. The plate is actuated by a toggle lever for swinging it forward to release the tension on the endless V-belt when shifting from one pair of steps to another on grooved sheaves. An automatic safety brake is carried on the removable cover plate of the speed box.

The same lathe can be had without the open head, or with three V-belts driving the headstock from the Rivett speed box. This drive provides six selective speeds, forward and reverse.

# LOWELL

## Reversible Ratchet Wrenches

. . . will stand more abuse than any other tool of its kind on the market.



Let us know your problems. Try these time saving tools on your machines.

*Send for Catalog W*

**Lowell Wrench Co.**

WORCESTER, MASS.

## Farrel 36-In.x12-Ft. Heavy Duty Roll Grinder

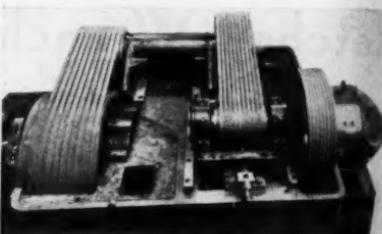
The major requirement of the modern roll grinding machine is the combination of accuracy, finish and speed. The roll grinding machine, therefore, must be capable of applying the finest mirror surface on rolls for rolling high finish sheets and must be equally capable of taking heavy cuts for rough grinding and of refinishing rolls with the required accuracy and finish in the shortest possible time.

To eliminate the vibrations inherent in even the most accurate and carefully mounted gear-driven headstocks, with consequent marking of the rolls requiring much time and trouble to remove, the 36-in. 12 ft. Farrel Heavy Duty Roll Grinder shown in the accompanying illustration, product of Farrel-Birmingham Company, Inc., 381 Vulcan St., Buffalo, N. Y., is built with a multiple V-belt drive for rotating the rolls. The performance of several of these machines so equipped has proven conclusively that an excellent finish is obtained in a minimum of time. In one steel mill rolls that formerly required five to six hours are now being finished in two hours with a perfect surface free from marks.

The headstock drive on this 36-in. machine is self-contained in one cast iron case mounted directly on the front bed. Three reductions, all of which are multiple "V" belt drives, reduce the speed of the 300-1200 r.p.m. motor to give a range of roll speeds from 11 to 44 r.p.m. The drive is equipped with precision type, anti-friction bearings throughout, including the bearing supporting the large faceplate pulley. The bearings are mounted in adjustable housings and each

of the three reductions can be adjusted separately to give the proper tension on the belts without the use of idler pulleys. The bearings are grease packed and will run from six months to a year without replenishment of lubricant. Additional grease is applied by a grease gun through readily accessible fittings.

An improved type of flexible faceplate, with balanced, self-equalizing bar equipped with adjustable rubber-bushed

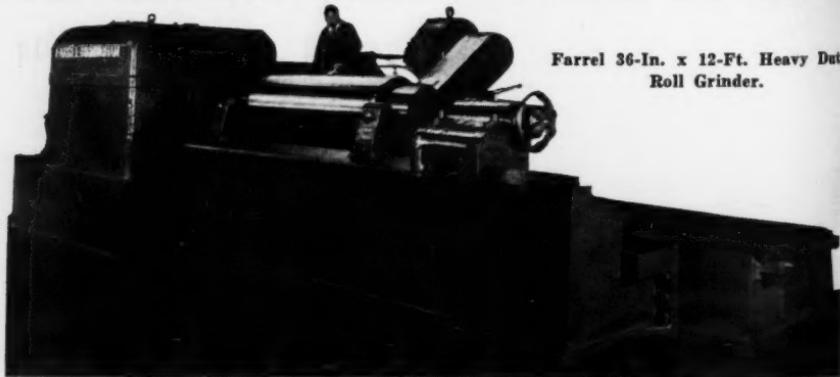


Multiple V-Belt Drive for rotating rolls of Farrel Roll Grinder.

driving dogs, compensates for inequalities in roll wobblers and automatically minimizes inaccuracies due to minor errors in setting the roll.

The diameter of the grinding wheel has been increased from 30 in. to 36 in. so that, at the same wheel surface speed, the speed of the spindle is reduced, permitting a closer fit of the bearings and at the same time resulting in cooler running bearings.

Other standard features of Farrel grinders have all been incorporated in this machine, with improvements wherever possible. These include a patented cambering device which produces a



Farrel 36-In. x 12-Ft. Heavy Duty Roll Grinder.



**IF IT IS A HIGH-SPEED GRINDING OR CUTTING JOB STERLING BAKELITE BONDED WHEELS WILL DO IT.**

On swing frame and floor stand grinders, rigid and portable cut-off machines, Sterling high-speed wheels are operating in thousands, grinding or cutting with maximum efficiency.

Sterling will gladly send a representative to study your grinding problems without obligation.

## THE STERLING GRINDING WHEEL COMPANY

Abrasive Division of The Cleveland Quarries Co.

Factory and Office  
TIFFIN, OHIO



CHICAGO: 133 N. Wacker Drive  
DETROIT: 5191 Lorraine Ave.

**STERLING**

**ABRASIVES**

mathematically accurate curve for a crowned or concaved roll, exactly symmetrical both sides of the center of the roll; dead center head and footstocks; water-shedding front bed; centralized controls at the operator's station; flood lubricated, inverted "V" ways; flexible steel covers for the carriage ways and drive rack; double helical gear to worm and rack traverse drive; and multiple "V" belt spindle drive.

### World's Largest Press Brake Will Handle Heavy Plates 18 Feet in Length

Constructed to handle steel plates up to 1 inch in thickness in lengths up to 12 feet and steel plates  $\frac{3}{4}$ -inch in thick-

plates in extremes of thickness and length as required by its customers as well as for use in the manufacture of the welded steel structures produced by the Lukens division for machinery and equipment manufacturers.

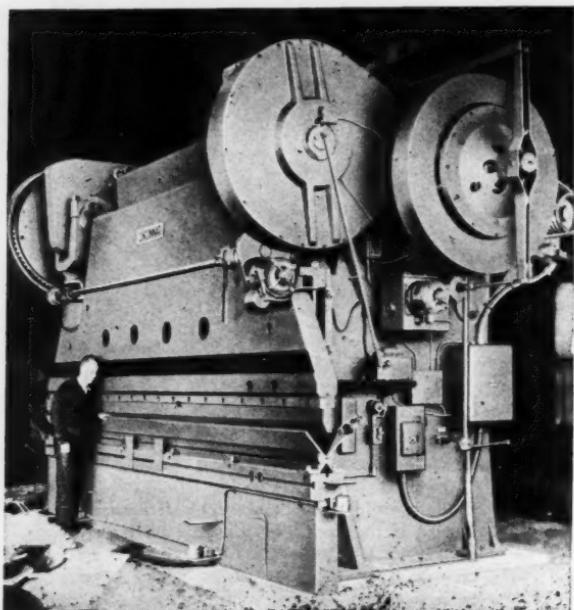
The press brake is of the characteristic design of the standard line of all-steel press brakes manufactured by The Cincinnati Shaper Co. It has a clear distance between the housings of 12 ft. 6 in. with an overall working length of die surface of 18 ft. through a 14 in. throat.

The ram has a stroke of 6 in. and an adjustment of 6 in. with a distance of bed to ram, stroke down and adjustment up, of 14 in. Independent adjustment to each end of the ram is provided to take

care of fade out or cone work. Two speeds are provided through a gear shift transmission so that the machine may be operated at either five strokes per minute or twenty strokes per minute. The clutch is hydraulically operated by electrical control from each or all of several stations for convenience and effortless operation.

One set of five dies gives complete range for general purpose work for plates ranging in thickness from No. 10 gauge up to 7 in. The machine will develop safe working loads up to 1,000 tons.

The brake is of steel construction throughout using heavy steel plates of analyses especially adapted to flame-cutting and welding. The housings, flame-cut from two steel plates 8 in. in thickness, 87 in. in width, and 13 ft. 8 in. in length, weigh 33,000 pounds each. The bed and ram were flame-cut from two steel



World's Largest Press Brake, Built by Cincinnati Shaper Company.

ness in lengths up to 18 feet, the largest machine of its type ever built for bending, flanging, forming and multiple punching was recently completed by The Cincinnati Shaper Co., Cincinnati, Ohio. The press brake has been installed in the By-Products division of Lukens Steel Company at Coatesville, Pa., and will enable Lukens to supply bent or formed

plates 7 in. in thickness, 72 in. in width, 18 ft. in length and weigh 31,000 pounds each.

Among the interesting features of the design of the machine is the employment of a divided pitman which, in conjunction with the cylindrical supports for the bed and ram, assures that the load of the press brake is carried di-



- MACHINIST . . . . .** "I prefer MoTUNG tools because they outcut other high speed steels and break less because they are tougher. Our piece workers prefer MoTUNG tools because they are equal to or better than 18-4-1 in all applications."
- TOOLMAKER . . . . .** "Yes, and MoTUNG works more easily and costs less to machine. The hardened tools are sharpened with less cracks."
- METALLURGIST . . . . .** "MoTUNG heat treats at least 150° lower and has lower heat treating costs."
- PURCHASING AGENT . . . . .** "MoTUNG is economical because it weighs 9% less than 18-4-1. The basic materials are mined in the U. S. A., and we can depend on a stable price and supply."
- PRESIDENT . . . . .** "All right! Let's keep up with the economies some of our competitors and other manufacturers are making. I've been looking over a list of successful MoTUNG applications made during the past three years and the proof of quality is conclusive. In addition, this idea of not being affected by fluctuations in price and supply appeals to me."

Ask your tool manufacturer for MoTUNG tools or write us for the new MoTUNG Booklet No. 101.



MoTUNG, a brand of MO-MAX High Speed Steel, is available through any of the offices or warehouses listed below.

PRESENTED BY

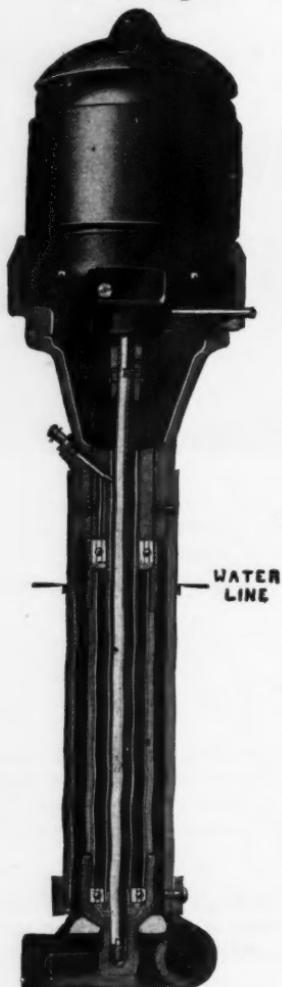
**UNIVERSAL STEEL COMPANY AND CYCLOPS STEEL COMPANY**  
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February, 1935

## Brownie Coolant Pump



Capacities 10-100 G. P. M.

Write for Bulletin No. 10

**Tomkins-Johnson Co.**  
620 N. Mechanic St., Jackson, Michigan

rectly on the center line of the housing, thus avoiding eccentric loading. The screw in the pitman is a heat-treated Nickel-Chromium alloy steel forging cut with a buttress thread, having a full ball and socket joint, with ball ends hardened and ground.

Ram adjustment is accomplished by independent motor through a hardened and ground worm and bronze worm wheel on the screw. In connection with the independent adjustment of each screw, Ames dial indicators show the position of the screw or the ram with relation to the bed and also the position of each screw with reference to the other.

Another interesting feature is the use of ball bearings under the steel flywheel, which is 56 in. in diameter, weighs 4,000 pounds, and runs at 600 r.p.m. The flywheel shaft is mounted on two double roller bearings. The multiple disc clutch is contained in the outer face of the flywheel.

The several electrical control stations are arranged with cut-out switches so the machine may be operated from any one station or may require the operator at each point to push his button before engaging the clutch as a matter of safety. An oiling system with two stations, one on each housing, furnishes complete automatic lubrication. The press brake is driven by a General Electric 50-horsepower high torque motor, connected by vee-belts to the flywheel.

### "Gen-Arc" Electric Welder

An arc-welding machine that will operate on either 110 or 220 volt A. C. circuit is now being marketed by the General Equipment Company, 311 South Wichita Street, Wichita, Kansas. The welder is made in three sizes; 200, 240, and 300 amperes, the smaller size machine being intended for such work as repairing bumpers, frames, and other automobile work, and the larger sizes being suitable for not only the work referred to but general machine shop and welding shop work as well. The model C-300 is adaptable for any work up to  $\frac{1}{2}$ -in. plate and heavy castings using up to and including  $\frac{1}{4}$ -in. electrodes. Any make of electrode, either coated or uncoated, can be used with this machine.

The Gen-Arc welder has no moving parts, requires no cooling system, and will operate continuously without heating. The machine is said to be ideal for building up scored shafts and broken castings, as well as for other welding tasks of a general nature.

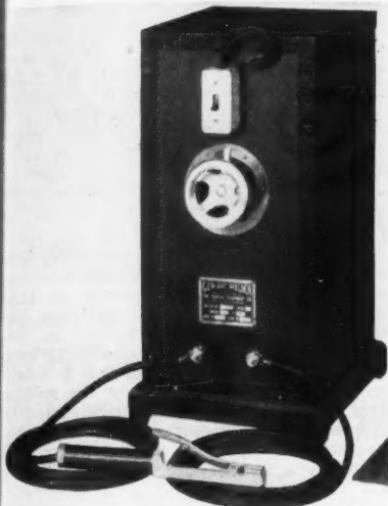
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The manufacturer states that the cost of operation is very low as the machine develops high efficiency at a rating of 4½ cents per kilowatt. Continuous operation of the 200 ampere model will run



General Arc Electric Welder

approximately 23 cents per hour. All models are furnished complete with shields or hemlets, ground and electrode cables, ground clamp, electrode holder, and a supply of rod in several sizes.

#### Cross No. 35 Gear Tooth Rounder

The Cross Gear & Machine Company, 3248 Bellevue Avenue, Detroit, Michigan, has brought out a new line of machines for performing the various rounding, pointing, chamfering and burring operations on gears of all kinds. Each machine operates on a principle that is entirely different than either of the others and each machine is said to be particularly well suited for performing any operation within its scope. All of the machines are fully hydraulically controlled.

The Cross No. 35 gear tooth rounder can be used for producing any desired shape on the ends of any style of tooth, on any and all types and sizes of gears. It is also used for burring operations and for rounding splines.

The machine is both rigid and flexible in accord with present day requirements.

## COATED ABRASIVES BY CLOVER

**T**HE Clover Color-Stripe line of Coated Abrasives represents the last word in efficiency and work value.

Flint, Emery, Aluminous Oxide, Silicon Carbide and Garnet—supplied in sheets, rolls, belts and discs.

Everything the wood-worker, painter and metal-worker requires—and, of a quality and work-value rarely found and seldom equalled.



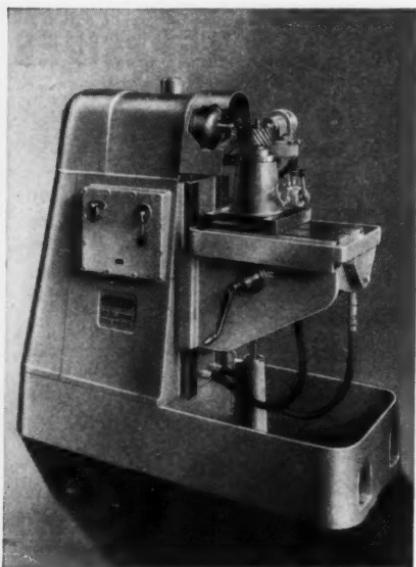
It costs no more to get the best, but it's a whale of a satisfaction when you have it.

Ask for Clover Color-Stripe Abrasive Papers and Cloths, and see how much better they really are—once tried, you will never be satisfied with the ordinary kind.

All good jobbers and mill supply houses can supply you.

**CLOVER MFG. CO.** NORWALK,  
CONN.

Also makers of the famous  
Clover Grinding and Lapping  
Compounds



Cross No. 35 Gear Tooth Rounder

A start-stop lever at the operator's station facilitates control, and when the machine is stopped, all mechanisms automatically come to rest in the loading position. The correct feed is easily obtained with the feed control lever, also located at the operator's station.

Cams have been entirely eliminated in the design of this machine, the mechanism being actuated by hydraulic prime movers. The automatic index mechanism is completely universal throughout the entire range of the machine and is easily adjusted to meet any specific requirements. Each tooth is always individually located in exact relation to the cutter and the gear is held rigid during the cutting operation.

The machine is of the knee-type construction. The main spindle assembly, weighing 124 lbs., is carried on four Timpkin Tapered Roller Bearings, and the sub-spindle is mounted in pre-loaded precision double-row ball bearings. The head of the machine is a self-contained unit composed of the spindle, the rack which actuates the spindle, and the sector which locates and holds the gear tooth while it is being rounded.

Gears with varying numbers of teeth

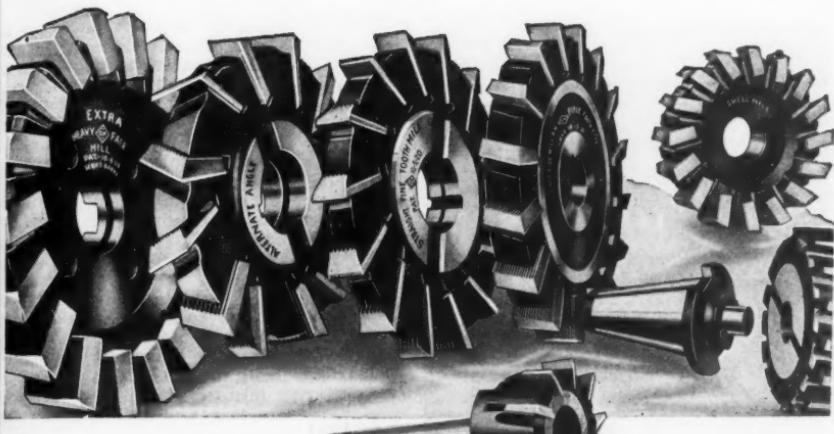


## WIZARD Quick-Change Chuck

Keep the Spindle Turning. Enable the operator to go from drill to reamer to tap without stopping or slowing the machine. Hold tools rigid and centered. WIZARD Friction-Drive Collets prevent tap breakage and speed up tapping . . . Four sizes of chucks with variety of Morse taper shanks. Collets for every type of tool. Find out how these sturdy time-savers can boost your production. Send for Bulletin 14-B.

MCCROSKEY TOOL  
CORPORATION  
MEADVILLE, PA.





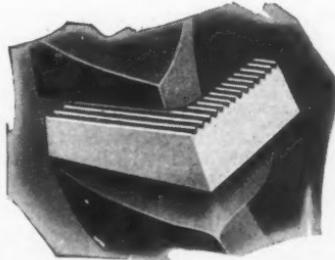
*There's a*

## COST-CUTTING O.K. CUTTER FOR MAJOR MILLING JOBS

SOMEWHERE IN YOUR PLANT  
THERE IS NEED FOR O. K. CUTTER ECONOMY

O. K. Milling Cutters are made in light, medium, heavy and extra-heavy duty. Each has an economy message for the man whose profit margin demands a high, uniform level of production. Proof of this is the known fact that, once introduced into a department, O. K. Cutters rapidly become standard equipment . . . simply because of their very visible ability to step up production. Without obligation or undue sales urge, we should like to send you an O. K. representative.

THE O. K. TOOL CO.  
DEPT. M  
SHELTON, CONN.



O. K. Milling Cutter Blades lock firmly in place without screws, pins or wedges. This allows for closer tooth spacing when necessary. Mating serrations in the blade permit fine adjustment in line of wear.



**SYSTEM**  
OF INSERTED-BLADE METAL CUTTING TOOLS



## REDUCE COSTS ON ALL LIGHT GRINDING WORK

Above is shown Porter-Cable Type B-12, 6" Belt Grinder for bench use, grinding face of bearing cap . . . only one of the hundreds of cost reducing uses for this sturdy, but inexpensive, grinder. Every machine shop and tool room should use this profitable grinding method.

"We reduced our hand filing more than 75% when your Belt Grinder was put on the job, and another 50% was saved on cost of files."

Name on request.

**PORTER - CABLE**  
Belt Grinders are built in several models, one of which is certain to exactly suit your requirements. Illustration shows a practical operation on our Type B-3, 10".



Let us run a test on one or more of your ground parts and give you actual figures on these savings . . . or write for further details. No obligation, of course.

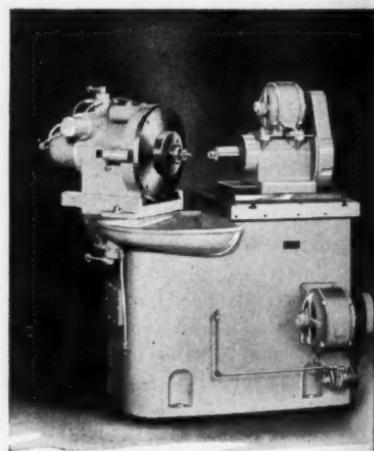
**PORTER - CABLE MACH. CO.**  
300-2 WOLF ST., Metal Division, SYRACUSE, N. Y.

can be rounded without indexing adjustments, provided they are of the same pitch. The motor drive is housed in the column of the machine and the power transmission is accomplished through the medium of multiple Vee belts. Work holding fixtures are of elementary design and are hydraulically actuated and controlled.

The machine has a capacity for handling gears to 36 in. diameter with 15 in. gear face capacity, and of 2 pitch or finer. Feeds, hydraulically controlled, are unlimited between 0 and 20 ft. per minute. The machine is fully strong and the feeds are fully powerful to make practical the use of carbide cutters whenever desirable. Speeds, hydraulically controlled, are unlimited between 0 and 120 teeth per minute. Floor space required is 32 x 60 inches, and net weight is 3400 pounds.

## Cross No. 40 Gear Tooth Pointing Machine

The Cross gear tooth pointing machine is available in two models; the No. 40 machine, which is of single spindle design, and the No. 41, which is of the



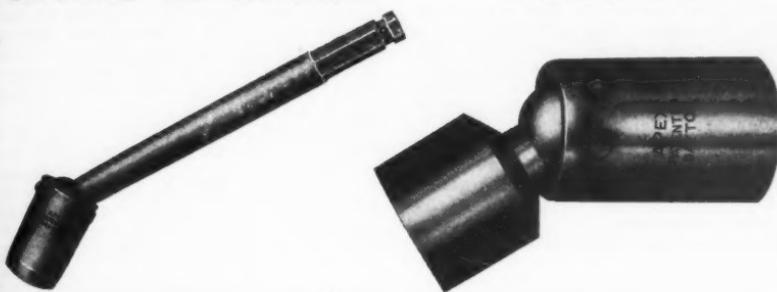
Cross No. 40 Gear Tooth Pointing Machine

two-spindle two-station type. This machine is used for pointing the ends of gear teeth, particularly those of synchromesh clutch gears and spiral and spur sliding gears. The machine can also be used for burring and chamfering operations of certain kinds. Gears with either



## Universal Joint Socket Wrenches

## UNIVERSAL JOINTS



For tightening nuts and screws in hard-to-get-at places are real time and money savers on assembly operations.

Shanks are furnished for any size or type of electrical or air tool—also furnished with shanks to fit Yankee Screw Drivers for small assembly work. Sockets are furnished in any length, diameter and broaching to suit to job.

Apx Universal Joint Socket Wrenches will reduce your assembly costs.

Are time tested—simple in construction and exceptionally strong. No projecting ears, pins, screws or sharp corners. They cannot over travel their working angle of 35°. Diameters  $\frac{1}{2}$ " to 4".

Ends can be bored for connection to your shafts, or may be machined with square holes or the ends may be turned to form shoulders. We can machine them to meet your requirements.

Used in hundreds of plants for all kinds of angular drives and controls. Also used on aircraft for fuel cock controls, stabilizer controls, starter cranks and retractable landing gear.

*Write for Full Information and Prices*

**THE APEX MACHINE & TOOL CO.**

THIRD AND MADISON STREETS, DAYTON, OHIO

internal or external teeth can be machined with equal ease.

The No. 40 machine is a semi-single purpose tool which employs a hollow mill type of cutter. The mill is moved into the work, which is held stationary. It is claimed that the machine will produce high quality work at the fastest possible rate as well as a minimum of cutter expense. The machine is equipped with full hydraulic control. Cams have been entirely eliminated and hydraulic prime movers actuate the mechanisms which formerly were cam-controlled. The exceptional rigidity of the machine makes possible a smooth, harmonious synchronization of motions with freedom from vibration. All controls are centrally positioned at the operator's station. When the stop lever is moved, the cutter automatically retracts from the work by power rapid-transverse, coming to rest in the loading position. The correct feed for any given job is instantly available.

Automatic indexing, hydraulically controlled, is accurate within 0.0001 inch. A hardened steel taper plug locates the dividing plate by registering in a hardened steel taper bushing.

The cutter head is mounted on a table

which, in turn, is mounted on Cross ball bearing gibs, assuring long life, rigidity and freedom from friction. All moving parts are totally enclosed and function in a full bath of lubricating oil. Effective means can be provided to retain the oil and to protect the vital mechanisms from dirt and chips. Hydraulically-actuated work holding fixtures are built into the machine and are furnished as part of the standard equipment.

The construction of the machine includes a minimum of moving parts, with exclusive use of anti-friction bearings, the transmission of power through multiple Vee belts, an efficient lubricating system and easy accessibility to all enclosed parts. A large reservoir in the base of the machine is provided for the hydraulic fluid and the oil pump and valves are also mounted in the same compartment. The dividing head of the machine is a self-contained unit.

The machine will handle gears up to 12 inches face, 20 inches diameter, and of 2 pitch or finer. Feeds, hydraulically controlled, are unlimited between 0 and 20 ft. per minute. The strength and rigidity of the machine are ample for the use of carbide tools. Speeds, hy-

*A GOOD WAY  
To Keep Production Costs Low  
in 1935*

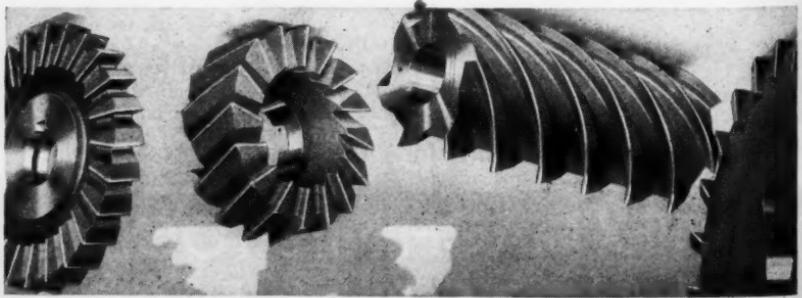
*—Buy GOOD Cutters  
.. cutters that will give the  
LOWEST REAL CUTTER COST*



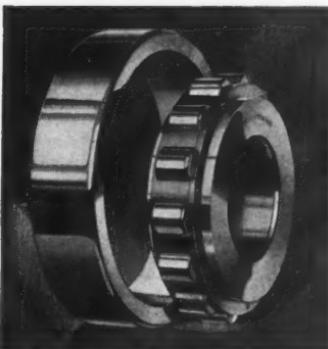
## —BROWN & SHARPE CUTTERS

Modern — Efficient — Keep Costs Low

Brown & Sharpe Mfg. Co., Providence, R. I.



# WHERE NO OTHER TYPE OF BEARING WILL



## STAND UP

*Because of Extreme Load Conditions, Use*

### PRECISION ROLLER BEARINGS

*With the Heavy Bronze Cage*

#### PARALLEL LINE CONTACT

Solid cylindrical rollers between cylindrical racee provide maximum load contact area, insure ready load capacity, and a larger shock-absorbing capacity than any other type of single-row bearing.

#### SAFETY FACTOR

A margin ample for temporary overloads up to 50% beyond normal rating, as under peak loads, in unusually severe duty, or under shock conditions.

#### SUPERIOR CAGE

Made of extruded bronze to secure maximum density and uniformity—machined all over for balance—riding on inner ring lands or shoulders, reliving the rolling elements of its weight.

#### EXTREME ACCURACY

Rollers held to .0001 inch on diameter and  $\pm .002$  inch on length, throughout—absolutely true rolling surfaces, ends absolutely square with the sides—highly finished, quiet, friction-free.

#### DURABILITY

Uniform contact throughout the length of the rollers, providing the most efficient load distribution—greater wear-resisting surfaces—true rolling between all load contact areas—minimum friction between roller and cage.

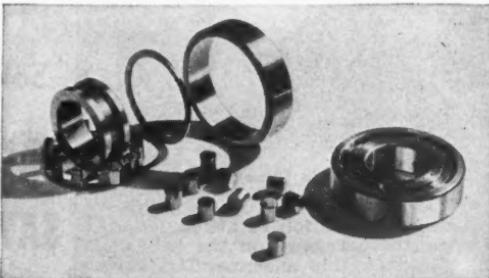
#### SPEED QUALITIES

A lower friction coefficient under heavy load than any other type of bearing—a speed ability equal to that of any ball bearing, size for size, up to 35,000 R.P.M.

There's no duty too hard for a PRECISION Roller Bearing. And, for the less exacting duties, there are PRECISION Ball and Thrust Bearings. Write for the Catalog—or ask our engineers for suggestions.

Picture to yourself the most difficult load conditions a bearing can be called upon to meet—high speed, heavy load, temporary overloads, shock, vibration. Then read, in the adjoining column, how NORMA-HOFFMANN Precision Roller Bearings—time-tested heavy-duty units—meet these conditions.

And remember—PRECISION Roller Bearings interchange in size with all standard ball bearings. They can be had—in addition to the standard type here illustrated—in one-lip, two-lip (self-contained), full roller type (without cage), self-aligning and adapter types.



## NORMA-HOFFMANN

### PRECISION BEARINGS

BALL, ROLLER AND THRUST

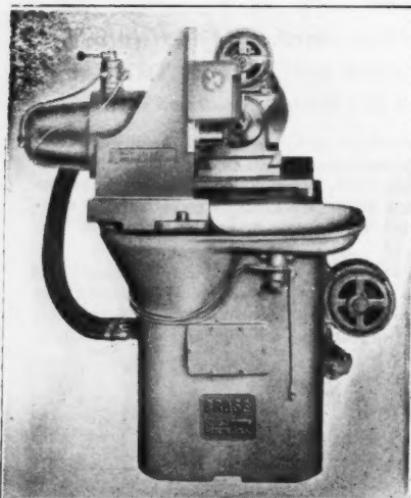
NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

dramatically controlled, are unlimited between 0 and 120 teeth per minute.

All moving parts are lubricated by being constantly splashed with oil. Ball and roller bearings are used throughout. The dimension from center of cutter spindle to floor is 41 inches. Capacity of oil tank, 30 gallons. Floor space, 52 x 60 inches. Net weight, 3000 lbs. Capacity of oil tank on No. 41 machine, 60 gallons. Floor space, 81x60. Net weight, 6200 pounds.

#### Cross No. 50 Gear Tooth Chamfering Machine

Cross gear tooth chamfering machines are available in two models; the No. 50, which is a single spindle machine, and the No. 51, which is of the two-spindle, two-station type. Any shape or



Cross No. 50 Gear Tooth Chamfering Machine

alternating combination of a number of shapes can be developed on the ends of gear teeth with this machine. The machine is capable of processing spiral, spur, or helical gears, having either internal or external teeth. It can also be used to generate irregular shapes on the ends of all kinds of gear teeth or for burring and chamfering operations of certain types.

The Cross No. 50 gear tooth chamfering machine is a semi single-purpose tool employing an orthodox external



## Red on a File or Hacksaw Blade

is a registered  
trade mark  
that quickly  
identifies

**HIGHEST QUALITY**

Sold by Supply Dealers.

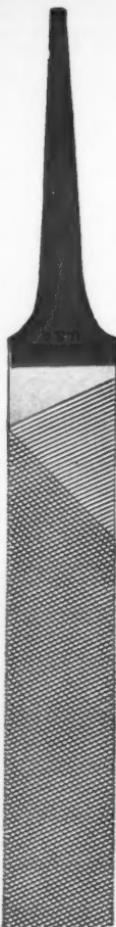
# SIMONDS SAW AND STEEL CO.

*Established 1832*

FITCHBURG, MASS.

Headquarters for  
Metal Cutting Saws

# RED TANG RED END STREAK



The File with  
the Metal Saw Tooth



Tungsten  
Steel



High Speed  
Steel

cutter. The cutter spindle remains fixed while the work spindle is movable; thus the work is presented to the cutter. While the gear is being rotated, the work holding spindle is moved forward and back with a guide cam mounted at the side of the head assembly. Automatic indexing presents each successive tooth to the cutter and the cutting operation is carried on continuously. The work and the cutter are never separated from each other except while rotating.

The work is independently driven with a hydraulic motor, regulated by means of a control valve which permits a quick and easy adjustment of feed and speed. A hydraulic cylinder keeps the cam follower firmly against the cam, maintaining the utmost rigidity when the cam motion is reversed. Another hydraulic cylinder holds the indexing gear firmly in mesh with the work during the cutting operation, and this same cylinder retracts the indexing gear to facilitate loading and unloading. Hydraulically-actuated work holding fixtures are built into the machine and are furnished as a part of the standard equipment. All moving parts are totally enclosed in a bath of lubricating oil from which the dirt and chips are excluded.

A distinct advancement in construction has been achieved by mounting the work head solidly and directly on the box unit base of the machine, thus obtaining unusual rigidity. The base of the work head serves as a dial and is graduated to facilitate setting up operations. All controls are centrally positioned at the operator's station.

The machine will handle up to 15 in. face and 20 in. diameter, of 2 pitch or finer. Feeds are unlimited between 8 and 20 ft. per minute and speeds are unlimited between 15 and 90 teeth per minute. Ball bearings are anti-friction ball and roller bearings and power is transmitted through multiple Vee belts completely enclosed. The capacity of the oil tank is 35 gallons. Floor space required is 54x61 inches. Net weight, 320 pounds.

#### Kidder Combined Punch and Shear No. 33

The illustration shows a bench punching and shearing machine that is now being marketed by the J. F. Kidder Manufacturing Company, 424 Colchester Avenue, Burlington, Vermont. The machine is built of steel plate, arc-welded in so-

## GORHAM . . . Ground Tool Bits and Turning Tools . . .

Now you can get GORHAM Ground Tool Bits and Turning Tools by the box from your local jobber. GORHAM Tool Bits are accurately ground and are expertly made by cutting tool specialists. They give more satisfactory results. These Tool Bits are available in three distinctive cutting Materials . . . GORHAM Standard to cover the commercial field, GORHAM Imperial to cover the field of heavy cuts in hard material, and GOR-MET for the more abrasive materials.

Order from your dealer or write us direct for new circular giving prices.

### GORHAM TOOL COMPANY

14400 Woodrow Wilson Ave.  
Detroit, Michigan



# ratifying indeed

It is because of the ability of this magazine to produce such outstanding results for its advertisers that we have been granted material space increases for 1935 from the following concerns:

American Hollow Boring Co.  
American Saw & Mfg. Co.  
Apex Machine & Tool Co.  
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**MODERN MACHINE SHOP**  
704 RACE STREET,  
CINCINNATI, OHIO

## These Modern GUSHER PUMPS



will end your  
coolant troubles

Nine months ago, we furnished a GUSHER PUMP for a glass grinding machine. This PUMP has been in constant use—16 hours per day—and has not been serviced.

Before the GUSHER PUMP was installed, it was necessary for them (name on request) to replace the old pump every six weeks.

It may be to your advantage to replace some of your old pumps with new Gusher Coolant Pumps.

*Write for Catalog.*

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536 E. Front St. Cincinnati, Ohio

## MULTIPLE FLEXIBLE COUPLING

A product that has proven its merit in several hundred installations of every conceivable nature.



Patent No.  
1,802,342

FLEXIBLE COUPLINGS. Write for Literature and Prices.

Distributors Wanted—Write for attractive proposition.

**Multiple Boring Machine Co.**  
2221 Lucas Ave. St. Louis, Mo.

The connecting members are rubber covered steel pins held in place thru the cast iron flanges by a retainer ring on each side of the coupling.

It pays to standardize on MULTIPLE

cordance with the most modern practice. The cam is of cast steel. The machine has an adjustable die bed, and punches and dies are quickly changed.

The machine has capacity to punch

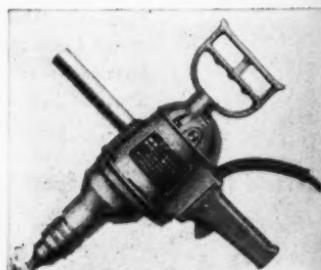


Kidder Combined Punch and Shear No. 33

5/16-in. holes in  $\frac{1}{4}$ -in. material. The depth of the throat is  $2\frac{1}{2}$  inches and the machine weighs 40 lbs. Punches and dies of either standard or special shapes can be furnished on order.

## Portable Signal $\frac{1}{2}$ -Inch Electric Drill, Type OB-5

The  $\frac{1}{2}$ -inch standard duty portable electric drill shown in the illustration, to be known as the Type OB-5, has been



Signal Type OB-5  $\frac{1}{2}$ -Inch Portable Electric Drill

announced by the Signal Electric Company, Menominee, Michigan. The drill is said by the manufacturer to have the correct speed and power, and is light

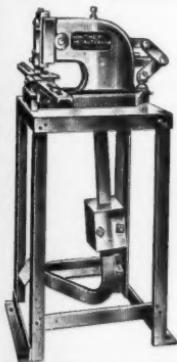


## *Rollway* COOLANT PUMPS

Territories  
Open for  
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Representation

Suited to every application for pumping coolants and lubricants. Advantages include automatic built-in relief valve, self priming, lower speed, longer life, greater capacity, high vacuum, and no clogging. Write for bulletin and dimension sheet.

**PIONEER**  
ENGINEERING & MANUFACTURING CO.  
8316 Woodward, Detroit, Mich.



FOOT PRESS No. 28



ANGLE IRON  
SHEAR No. 4

ASK FOR  
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No. 10 Punch

**WHITNEY METAL TOOL CO.**  
91 FORBES ST., ROCKFORD, ILL.

80 Items  
from which  
to choose



## THE E-6C FOR DRILLING & REAMING



### A POWERFUL STURDY TOOL FOR HEAVY DUTY WORK

The E-6C is well balanced and weighs only 26 lbs., so that it can be easily handled by one man. A governor controls the speed preventing excess wear and tool breakage.

#### CAPACITIES

Drilling  $29/32"$  to  $1\frac{1}{4}"$   
Reaming  $11/16"$  to  $15/16"$

TRY THIS TOOL FOR TEN DAYS

**The Rotor Air Tool Co.**

5600 Carnegie Ave., Cleveland, Ohio

weight, durable, and compact.

The motor is the Signal Universal, to use with either alternating or direct current, 110 or 120 volts. The speed, no load, is 420 r.p.m. The motor is enclosed in an aluminum alloy housing which is so designed that the brushes are accessible from the outside. High grade ball bearings on the armature shaft eliminate bearing troubles and provide the fullest efficiency for the operation of the motor. All gears are of special alloy steel, heat treated.

The tool is equipped with a handle of the breast plate type with detachable pipe handle and trigger-type switch with lock for continuous operation and comes equipped with 12 feet of heavy duty rubber-coated cord with rubber plug. The overall length of the drill is 16½ inches and the net weight is 14 pounds.

### Skilsaw Electric Hand Grinder

The design of the Skilsaw Electric Hand Grinder, which has been placed on the market by Skilsaw, Inc., 3310 Elston Ave., Chicago, Ill., embodies a number of features which make it adaptable for a wide variety of work. Its speed, power, and precision are said to give the tool



Skilsaw Electric Hand Grinder

an exceptional capacity for accurate work, and its portability and ease of handling increase its usefulness.

With the object of combining extreme speed with ample power and smoothness, a motor was developed which operates at a speed of 18,000 r.p.m. The armature is balanced both statically and dynamically and the field and armature windings are baked in Bakelite and varnish to insure long life. The motor is of the Un-

## FARREL-SYKES "The Gear With a Backbone"



Noted for their accuracy, durability, high efficiency and smooth and silent operation, they will enhance the value of any machine in which they are used. Available in a complete range of sizes:  $\frac{1}{4}$  in. to 22 ft. dia.  $\frac{1}{4}$  in. to 60 in. face 24 to  $\frac{1}{2}$  D.P.

Catalogs on request.

## FARREL-BIRMINGHAM

COMPANY, INC.

381 Vulcan Street, Buffalo, N. Y.

1854-1935

ACCURATE  
EFFICIENT  
DEPENDABLE



## Giant KEYSEATERS

Set-up Easy and Fast. Work held and aligned by its bore. No bolts or clamps required. Feed is automatic and definite. Keyways, straight or taper. Built in 1 sizes. Range of capacity  $\frac{3}{32}$ " to 5" wide and up to 60" long.

Write for full information.

## Mitts & Merrill

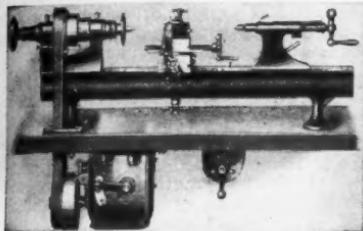
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Saginaw, Michigan

February, 1935

MODERN MACHINE SHOP 89

# Stark



#### HAVE YOUR STARK LATHE OR MILLER RECONDITIONED NOW

We restore them in most cases almost to the accuracy of new ones. Write us about repairs. Bench Lathes (6 sizes) Spring Bind Heads, for fast chucking. Auto Turret Heads. Motor Drive Unit, fits any bench lathe. Milling Attachment. Diamond Drills. Diamond Die Polishers, Collets, Chucks. Special Precision Tools.

**STARK TOOL CO.**

Originators of the American Bench Lathe  
Est. 1862 Waltham, Mass.

## 4 Holes at Once



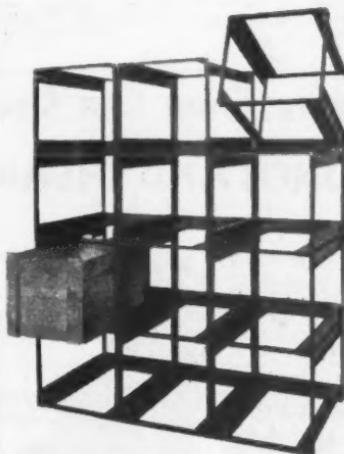
### With a U. S. Multiple Drill Head

You can save money and time with U. S. Multiple Drill Heads, standard or special according to the job. This head is for drilling 4 holes at once . . . with other U. S. heads as many as 50 holes can be drilled at one time.

Send blueprints of your jobs and we will show you what you can save with U. S. Heads.

**The United States Drill Head Co.**  
1954 Riverside Drive  
CINCINNATI, OHIO

## BOTTOM CASES Just As Accessible As The Top With THE STACKRACK



Patents Pending

You save space, time and labor by storing your boxes in an orderly manner, one on top of another. With the STACKRACK, each single box, or tote pan, may be moved easily without disturbing the others . . . bottom cases just as accessible as the top.

The STACKRACK can be used under benches, behind machines, to form auxiliary stockrooms and in any other place where the front of rack is open. Welded construction provides permanence and rack is attractively finished. It is inexpensive and made to order for boxes of steel, cardboard, fibre, or wood of any size.

Write for prices. Specify outside dimensions of boxes to be stacked, approximate weight of contents, height to be stacked, and quantity.

**STACKBIN  
CORP.**



TROY ST.  
PROVIDENCE, R. I.

versal type, and will operate on either alternating or direct current.

The body of the tool is made entirely of molded Bakelite, which is light, compact, and strong, and which has the added advantage of being a non-conductor of heat and electricity. The special grip-shank with ribs affords a convenient means of holding the tool.

The motor is cooled by a special fan which pulls an ample volume of air through the tool, a special filter being provided to protect the air intake. The filter is housed in a metal shell and is

instantly detachable for cleaning. Protection is thus provided against the entrance of dust into the motor and working parts. The grinder weighs but  $2\frac{1}{4}$  pounds, which is a great advantage in handling. A supply of grinding wheels of different sizes and shapes makes the tool adaptable for any type of work.

#### Dumore Motor with Electric Governor

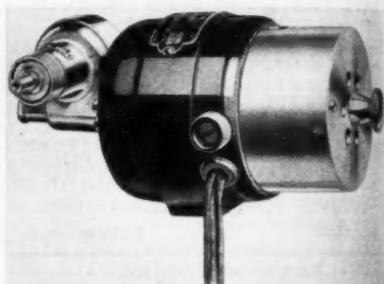
The Dumore Company, 28 Sixteenth Street, Racine, Wis., has brought out a line of electric motors equipped with electric governors, providing a combination of constant speed with the light

### Every Shop Can Use THIS COMBINED PUNCH AND SHEAR

Steel plate arc welded construction. Write for literature on our line of punches, shears, deep throat presses, angle shears, and notchers.



J. F. Kidder Mfg. Co., Inc.  
424 Colchester Ave.  
BURLINGTON, VERMONT



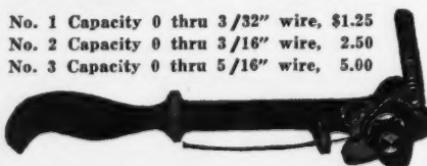
Dumore Type XAL Motor with Electric Governor

weight and power of series universal motors.

Two types of governors are offered; the adjustable type on which the speed can be varied while the motor is in operation, and the fixed type which can be adjusted only when the motor is at a standstill. Three sizes each of the two types are available for controlling the speed of Dumore motors rated  $1/64$  to  $1/8$  h. p. over a range of approxi-

### HERE'S A REAL SPRING WINDER!

- No. 1 Capacity 0 thru  $3/32$ " wire, \$1.25
- No. 2 Capacity 0 thru  $3/16$ " wire, 2.50
- No. 3 Capacity 0 thru  $5/16$ " wire, 5.00

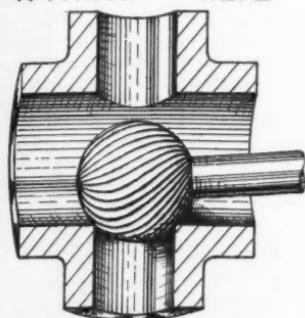


HJORTH LATHE & TOOL CO. 12 BEACON STREET, WOBURN, MASS.

*Will Earn Its Cost in One Day*

The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

# 'PROFILE' ROTARY FILES



**INTERNAL BURRING**  
 YOUR BURRING PROBLEMS SOLICITED  
 70 SHAPES & SIZES IN STOCK  
 Send For Catalog and Price List.  
**ROTARY FILE COMPANY**  
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## A New "D & W" Chuck

Style S-7 x 17



A sturdy, dependable chuck, 3 9/16" high to meet demand for lower chuck than our standard F-7 x 16.

List price (including Demag. switch) \$65.00.

List price (without Demag. switch) \$55.00.



**J. & H. ELECTRIC CO.**  
 202 Richmond St., Providence, R. I.

## CORED AND SOLID BRONZE BARS

13 inches long—cut in multiples of standard bearings without waste. Machined and centered. 116 stock sizes, at your supply house. Write for list.

## ANTI-FRICTION METAL

The Babbitt that always pleases. Non-adhesive, close grain. Lowest coefficient of friction in the industry. At all mill supply wholesalers.

## "READY-MADE" BEARINGS

Over 500 different sizes completely machined and finished — ready for assembly — available instantly from stock. Write for list.

**THE BUNTING BRASS & BRONZE COMPANY, TOLEDO, OHIO**

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**BUNTING Quality**  
 BRONZE BUSHINGS • BEARINGS  
 MACHINED AND CENTERED BRONZE BARS  
 ANTI-FRICTION METAL



mately 1,000 to 7,500 r. p. m. The motor is Type XAL; 1/25 h. p. with Model CR 2-inch adjustable-type governor.

Dumore electric governor controlled motors are especially well adapted for operating the new portable talking motion picture projectors, scientific instruments, and other apparatus where quick acceleration is required yet where constant speed under load is necessary.

In writing the Dumore Company to determine whether or not electric governor controlled motors are practical for a specific application the inquirer should state the type of equipment upon which the motor is to be used, load, duty cycle,

speed range, allowable speed variation, current, voltage, and whether the device is portable or stationary.

### Jarvis No. 100-J Tool Box

Manufacturers who have any quantity of tapping to do can now obtain a set of three Jarvis Bias Tapping Attachments, making it possible to tap the complete range of holes from No. 2 to  $\frac{3}{4}$  in. The set includes the No. 0 which taps from No. 2-56 thread to  $\frac{1}{4}$  in., the No. 1 which taps from  $\frac{3}{16}$  to  $\frac{1}{2}$  in., and the No. 2 which taps from  $\frac{1}{4}$  in. to  $\frac{3}{4}$  in.



Jarvis No. 100-J Tool Box

## "PROCUNIER"

HIGH SPEED, BALL BEARING

### TAPPING ATTACHMENTS

Tap Perfect Holes at Speeds up to 3000 R.P.M.—Reverse at 6000.

**Smoother, More Sensitive COMPACT**



Double-Cone, Long Life, Cork Faced, Friction Clutch.

Three Sizes with Capacities up to  $\frac{1}{2}$  in. in Steel.

Also other Styles and Sizes

Write for Literature and Prices.

**PROCUNIER SAFETY CHUCK CO.**

12 SO. CLINTON ST. -- CHICAGO, ILL.

—all packed in a steel box. The box provides facilities for keeping the tappers clean and in good condition and provides a convenient means for keeping the three tools together. There is no charge for the steel box; rather, reduction in the individual prices of the tappers is made when the complete set of tapping attachments is purchased.

This equipment is a product of the Charles L. Jarvis Co., Gildersleeve, Conn.

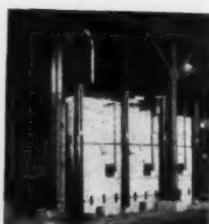
## BUILD YOUR OWN FURNACE WITH SAFETY AND SAVE 35%

By using R-S Plans, Bills of Material and Standard Parts

*Bulletin 37 tells you how.*

**R-S PRODUCTS CORPORATION**

*Builders of Furnaces since 1908*  
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## RAPID SLIP CHUCKS and COLLETS

Rapid Slip Chucks and Collets will increase the efficiency of your Drill Presses, Screw Machines, Lathes, etc. Stopping of machine spindle to insert collet is unnecessary. Collet is held rigidly, thus eliminating whipping and wear. Fast, economical, dependable operation is assured. Write for Bulletin No. 11.

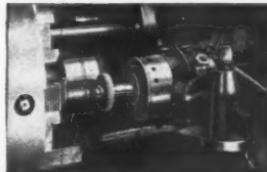
*Some territories open  
for manufacturer's  
agents.*

**AMERICAN  
EQUIPMENT CO.**  
5928 Second Blvd.  
Detroit, Michigan

## NEW All-Purpose PORTABLE GRINDER

Stanley announces a new, compact, powerful, high speed grinder —  $\frac{3}{8}$  H. P. Universal motor, 18000 R. P. M.

• The number of operations on which this machine can be used run into hundreds — new ones are appearing every day. The ones shown here are typical.



*In an engine lathe  
grinding outside  
of heat treated  
steel shell*



*As a hand portable  
grinder*



High grade precision bearings assure smooth operation and long life. Strong seamless drawn steel housing.

Grinder No. 585 complete with all equipment as illustrated \$48.50. Send for complete descriptive literature

**STANLEY ELECTRIC TOOL DIVISION**  
The Stanley Works  
NEW BRITAIN, CONN.



A COMPLETE LINE OF PORTABLE  
ELECTRIC TOOLS FOR INDUSTRY

## "Waltham" Pinion Cutting Machines



FAST  
AND  
ACCURATE

Operator can attend to several machines. For small pinions, a magazine feed not shown in the cut allows the machine to run without stopping, materially increasing the production. One, two, or three cuts, according to the nature of the work, may be made.

**Waltham Machine Works**  
WALTHAM, MASS.



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**Presses**

Write for our Catalog 36  
showing 64 different  
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Greenerd Arbor Presses  
NASHUA, N. H.

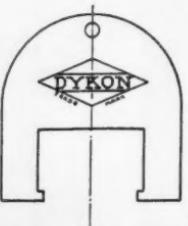
## GOOD DIAMONDS

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Diamonds and diamond tools will give you long, economical service IF they are (1) of proper quality, (2) properly set, (3) not abused.

Valuable Dykon Gage, as illustrated to help you determine when your diamonds need re-setting to give best results—Free.

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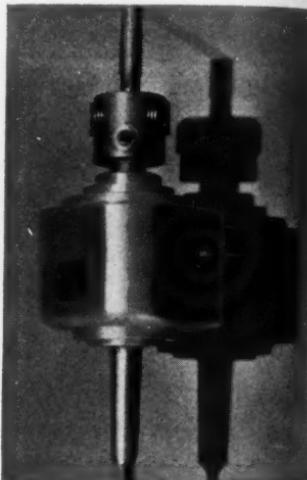
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Dykon  
Gage

J. K. SMIT & SONS, Inc

157 CHAMBERS ST., NEW YORK, N. Y.  
AMSTERDAM LONDON BAHIA

### Biax No. 2 Tapping Attachment

The Charles L. Jarvis Company, Gilde sleeve, Connecticut, has augmented its line of Biax tapping attachments by the addition of the No. 2 Tapper, shown in the illustration. The Biax No. 2 Tapper is of the same general design and construction as the Biax No. 0 and 1, t



Biax No. 2 Tapping Attachment

exception being that the No. 2 is equipped with a ball bearing idler gear.

The tapper is equipped with ball bearings throughout, and the clutches, which are of Textolite, are of the self-adjusting friction type. The reverse is double speed and double friction. All gears are chrome nickel steel, hardened and ground. The housing is of cast dia-lyte, designed for clear vision. The tapper is equipped with a Jacobs "double-grip" chuck which

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A. S. A. STANDARD



You will profit by using Colonial Drill Jig Bushings on your next job. Made with hole tolerances at least equal to any other jig bushings, Colonial Bushings are superior in that they are made of High Grade Tool Steel—Rockwell hardness of 62 to 64. Quick delivery. Write for bulletin and prices.

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(Division of Colonial Broach Co.)  
145 Jos. Campau St., Detroit, Mich.



**GITS**  
**Constant-Level Oilers**  
**with**  
**Unbreakable Bottles**



Maintain correct oil level. Prevent burning out of motors and bearings.

Furnished in both hinged and removable bottle types. Capacity  $\frac{1}{2}$  to 32 oz..

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DIAL "MIKE"  
POCKET GAUGE**

**\$15.00**

Measures  $\frac{1}{2}$ -1000" more accurately, easier and quicker than old style micrometer.

1. One inch capacity
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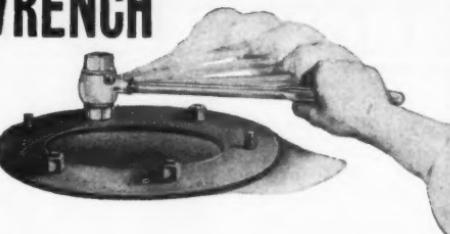
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**SPEED UP NUT TURNING with the . . .**  
**FAVORITE REVERSIBLE RATCHET WRENCH**

WORKS ON A QUICK STRAIGHT-AHEAD RATCHET MOVEMENT

The new metal now used in Handles, Heads and Pawls enables the "Favorite" to stand up under harder and rougher usage.

Ratchet movement eliminates all lost motion. Does not leave the nut until operation is completed.



**A TIME-SAVER**

Can be used in narrower places than an ordinary wrench. Each head can turn two different size nuts. One in each end. Opening in head allows bolt to pass clear through.

*Send for full particulars*

**GREENE, TWEED & CO.**

Sole Manufacturers

109 Duane St., New York

February, 19

will hold the tap by the square as well as by the shank.

### Sundstrand Index Bases

To meet the need for a standard type of index base that can be adapted for a wide variety of production milling jobs, the Sundstrand Machine Tool Company, Rockford, Ill., has brought out the index



**Sundstrand Index Base With Single Lever Control**

base shown in the illustration. This base is available in several standard sizes for use on any make of miller or other machine tool. The illustration shows the base in working position on a milling machine table. The base is also made with operation lever and clamping segment reversed so that the bases can be used in pairs on the ends of the table.

The operating lever controls a powerful slide, through two pairs of toggles to clamp the upper and lower parts of the index base securely together or to release the upper part for free, easy rotation. Accurately ground inserted wedge strips of hardened steel come together when the two parts of the base are clamped, thus assuring accurate alignment, solid support, and great durability. An index base aligns the work accurately, and a solid clamping of the upper and lower parts of the base against relative movement is assured by the tremendous pressure exerted by the two toggles on the double-bevel surfaces. When the upper part of the base is released, it moves upward slightly under the influence of seven springs which act against a large ball thrust bearing and the upper part of the base is perfectly free to turn around the central stud. Indexing is facilitated by the ball thrust which enables the operator to align the upper and lower parts of the base.

The base is available in six sizes from 12 x 24 in. to 20 x 30 in. The net weight of the former size is 325 lbs.; of the latter size 700 pounds.

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<b>CLARITE</b>	High Speed Steel
<b>SUPERDIE</b>	High Carbon, High Chromium
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February, 1935

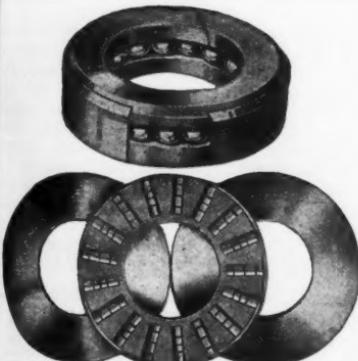


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Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now. Write for catalogue.

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"The Bridle for Air Horsepower"



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Poppet type with renewable seats, and sealed by air pressure, assuring exceptional speed, easy control, coupled with safe operation over a long period of use.

All ports being on one face, Ross Operating Valves may be mounted on a plate to which the piping is attached, thus making the piping a permanent installation. To remove the valve merely loosen the bolts. Made for the control of single and double acting cylinders in all pipe sizes ranging from  $\frac{3}{8}$ " to  $1\frac{1}{4}$ ". Hand, foot or solenoid control.

*There is a Ross Operating Valve for every air controlled operation in your plant. Write for catalog.*

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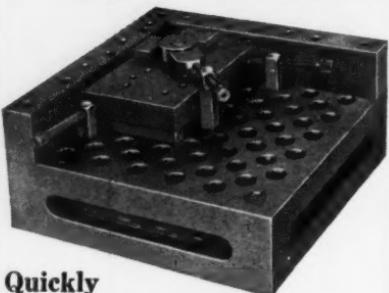
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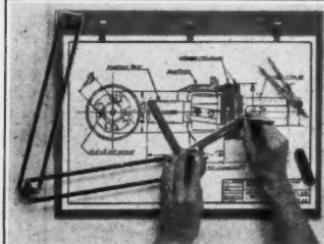
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DRAFTO



SIZE 20-H FOR DESK USE

### D & W Magnetic Chuck Style S-7 X 17

The line of "D & W" magnetic chucks made by the J. & H. Electric Company, 202 Richmond Street, Providence, R. I., has been augmented by the addition of the Style S-7 X 17, shown in the illustration. This chuck was developed to meet the demand for a chuck of lower height.



D & W Magnetic Chuck Style S-7 X 17

than the Style S-7 X 16 also made by this company.

The plain top plate of the chuck is  $7\frac{1}{2}$  x  $17\frac{1}{2}$ , and the base dimensions are  $7\frac{1}{2}$  x 18 inches. The height of the chuck is 3-9/16 inches and the weight is 95 lbs. The chuck can be supplied for either 115 or 230 volts direct current, and can be used without a switch.

### Russell "Hold-Heet" Pyrometer Lance

Encouraged by the success of its wall-type pyrometer, the Russell Electric Company, 338 West Huron St., Chicago, Ill., is now offering a pyrometer of the portable or lance type. The instrument is of the low resistance type, combining high accuracy with rugged construction. "Streamline" design is used, and the entire protecting case and handle comprises a single aluminum casting.

This portable hand instrument will serve for checking temperatures in all

### PORTABLE DRAFTING MACHINES

**DRAFTO MACHINES** are complete units for use in Office, Shop, Home and School. Equipped with horizontal and vertical scales and 180 degree protractors. Mounted on special tempered Masonite Boards fitted with sturdy paper clamps. Size 10-H fits brief case; dwgs. up to 9x12 in.—\$4.25. Size 15-V for patent dwgs., charts, graphs; dwgs. up to 10x15 in. in vertical position—\$5.75. Size 20-H for desk use in office, shop, home, or school; dwgs. up to 12x18 in.—\$6.50. Postage prepaid on cash orders. \$1 must accompany C.O.D. orders.

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**W**ITH both hands free the operator of a Haskins Tapper does his work with a speed and accuracy never possible before. He feeds blanks with both hands from alternate sides of the fixture. The handling ease, the fine precision, the new speed and economy of Haskins Tappers, are increasing production capacity in many plants by as much as 100%. Write for illustrated booklet on the Haskins Method. No obligation. R. G. Haskins Company, 4667 West Fulton Street, Chicago.

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FLEXIBLE SHAFT EQUIPMENT  
with Greater Adaptability

applications where a wall-type pyrometer is used. For general use it has the additional advantage of portability. It is said to be unequalled as an exploring instrument for gathering heat data in chemical and industrial processes, and its performance is said to be outstanding as a "trouble shooter" and as a check tester in existing pyrometer installations.

The lightness, portability, and accuracy of the instrument makes it ideal for checking the individual melts of non-ferrous metals to make sure that they are poured at the proper temperatures.

**A HIGH SPEED LITTELL  
FEED ON A HIGH SPEED  
PRESS**

With eccentric operated scrap cutter, oiler, and automatic stop.

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Meters are available for three different temperature ranges; 800 — 1600 — 2500 deg. F. Special types of thermocouple are available for different applications.



Russell "Hold-Heet" Pyrometer Lance

including a silver disc contactor for quickly exploring surface temperatures. Hold-Heet pyrometers are sold on a "make good" guarantee.

#### Duralite-50 Hot Workers' Goggle

Men who work in confined spaces or where the temperature or humidity is high, will welcome the "Duralite-50 Hot Workers' Goggle" just announced by American Optical Company, Southbridge, Mass.

This new goggle practically doubles the area usually allowed for ventilation. The extra ventilation in back of the lenses keeps them free from fogging and steaming—and also keeps the area around the eyes cool and so prevents perspiration from obscuring the vision.

The hazards of stumbling, falling or colliding with objects because of obscured vision due to fogged lenses are eliminated by these new goggles. Besides providing clear and comfortable vision, Duralite-50 Hot Workers' Goggles

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Saves expensive power take-off  
Horizontal or vertical mounting  
Compact—Self-contained  
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**BROWN & SHARPE**  
**Geared Motorpumps**

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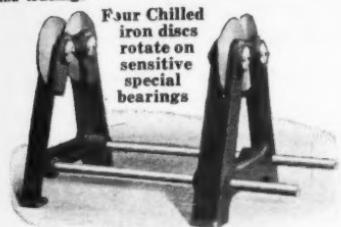
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Balancing  
Ways  
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A simple and excellent device for balancing and straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four Chilled iron discs rotate on sensitive special bearings



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Mfd. By **Anderson Bros. Mfg. Co.**  
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Greater Production  
Lower Maintenance**



**USE This Improved  
G-E WELDER**

**Better Welds . . .** It is built for heavily coated electrodes, and performs equally well with bare or lightly fluxed electrodes.

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The G-E Type WD welder is available in a variety of types—motor-driven, gas-engine-driven, and belt-driven sets. Write to General Electric, Dept. 6A-201, Schenectady, N. Y., for complete information.

140-15

**GENERAL ELECTRIC**

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RIVETERS — PIONEERS in their line—Head rivets from smallest to  $\frac{5}{16}$ " diameter; either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

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February, 1951

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standard Woodruff Keyway  
Cutters.



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*Special Cutters made to  
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**QUALITY TOOL WORKS**  
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provide dependable eye protection. Their sturdy construction plus the Super Armoplate lenses with which they are



Duralite-50 Hot Workers' Goggle

fitted give the worker a goggle he can wear with comfort and with confidence.

### Nicholson Superior Brand Milled Tooth File

Illustrated herewith is the Superior Brand Milled Tooth File now being marketed by the Nicholson File Company, Providence, R. I. The feature of the file is the unusual design of the teeth. The Nicholson Company's engineers have experimented until they have produced



Nicholson Superior Brand Flat Standard Cut File

A Norgren Sight Feed Automatic Air Line Lubricator feeds oil to the tool with the air that drives it. Constant, automatic lubrication. Adjustable from zero to complete saturation of air stream. Shipped on trial to any rated concern. Write for specifications and prices.

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curved tooth that is said to have correct angle and clearance to insure easy and rapid cutting, and to shear the surface of the metal rather than to plow it down.

The Superior Brand file is made in both rigid and flexible types, the flexible files being designed for use with special handles on either concave or convex surfaces. The file is especially useful



The BUCKEYE PORTABLE TOOL Co.  
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Also for buffing wire brushing, etc. R.P.M. 6" cap. Maximum pneumatic power as delivered by the perfect HERCULES rotary. Ask about No. 364.

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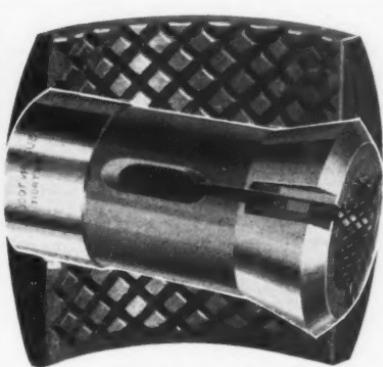


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Automatic Stop \$1.00 each  
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Send for Catalog No. 11 showing full Sutton line of screw machine accessories; collets, fingers, masters, tubes, spools, etc.

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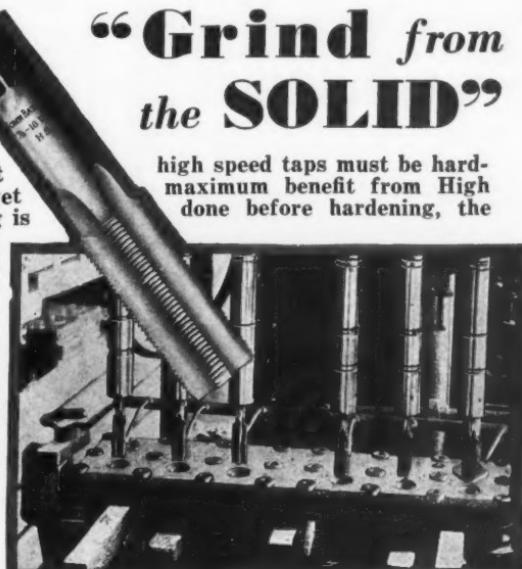
## “Grind from the SOLID”

EXPERIENCE shows that end at 2350° F. in order to get Speed Steel. If the threading is made delicate teeth will be distorted and injured by the intense heat during the hardening process.

“Grinding from the Solid” makes possible ideal heat treatment of high speed steel, eliminates inaccuracies and removes any decarbonized surface left from hardening. Write for the “Ground Thread Handbook”

**John Bath & Co.**

INCORPORATED  
**WORCESTER, MASS.**  
Taps—Chasers—Gauges



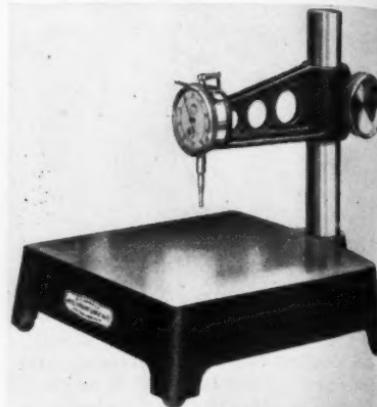
to automobile body workers or others who work on sheet metal where curved surfaces must be finished.

The file is made in 15 different designs, including the Narrow Flexible File for use between strips of moulding, the Square Standard Cut File for use on keyways, and the Superior Half Round Standard Cut File with teeth on the convex side only. The file shown in the illustration is the Flat Standard Cut File, which is intended for the work ordinarily done by the Bastard Cut File. It is said to be especially effective on aluminum, castings, babbitt, brass, cast iron and copper.

### Improved Ames Upright Gauge No. 13

Changes in this popular gauge, made by the B. C. Ames Company, Waltham, Mass., have been made to support the dial gauge more rigidly and to provide a quick and positive clamping of the bracket to the upright column.

The cast iron base with ground top surface 8 x 8 inches supports an upright steel column that is 1½ inches in diameter and extends 9-3/16 inches above



Improved Ames Upright Gauge No. 13

the base. The bracket which holds the gauge is especially rigid, extends about 4 inches over the base to bring the gauge at the center of the ground top surface of the base, and can be raised or lowered. A slight turn of the large diameter

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New design of an old clamping principle. Approved by automotive and parts assembly engineers. Has bronze bearings, closely fit parts and features easy adjustments. Now a standard product at attractive prices.

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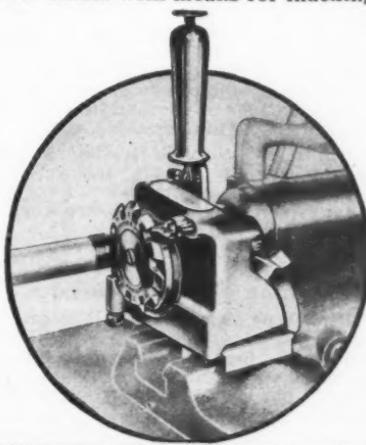
## RIVETT IMPROVED THREAD TOOL

Mounts on any screw cutting engine lathe. An unskilled operator can use it. For any diameter or form (except square) of six pitch or finer. THE THREAD TOOL is a holder for a ten tooth cutter with means for indexing the cutter to present each of the ten teeth successively to the work, and with adjustments for controlling the size of the finished thread.

THE CUTTER is a disc of the best tool steel with ten teeth, each tooth having a prescribed increase in radial length over the preceding tooth, thus comprising, in effect, ten cutting tools. The first nine teeth rough out the thread progressively in nine heavy measured cuts, and the tenth tooth finishes the thread. The responsibility of the operator is reduced to indexing the cutter when reversing the lathe. The thread tool does the rest.

Bulletin 110A

**RIVETT LATHE & GRINDER, INC.**  
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Furnished in many sizes—Floor and Bench Types 4" to 20" width of belt.  
**High Speed Labor Saving Machines**  
Also Centerless Feed Polishing Machines  
for Cylindrical Work

**PRODUCTION MACHINE CO. Greenfield, Mass.**

binding screw securely fastens the bracket and gauge to the upright column.

The gauge regularly supplied is 2-1/16 inches diameter, has a movable dial graduated 0-50-0 to indicate thousandths inches, and a small hand to indicate the number of revolutions made by the large hand. The spindle is raised 3/10 inches by pressing down the lever at left of dial. Other Ames gauges can be used with this improved No. 13 mounting, having larger dials, longer spindle travel, and indicating thousandths, half-thousandths, or tenths of thousandths inches, or hundredths millimeters.

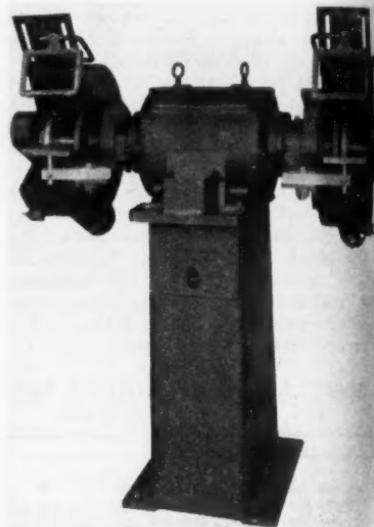
Maximum width, 8% inches; depth 8 inches; height 11-3/16 inches. Capacity to measure up to 5-15/16 inches with gauge regularly supplied. Net weight 16½ pounds.

### Production Type 894 Grinder

The machine shown in the illustration is the Type 894 grinder which has been added to the line of grinders and buffers made by The Production Equipment Company, 5221 Windsor Ave., Cleveland, Ohio. The brackets are designed for use with three different lengths of extension housings, the shortest for two-bear-

ing machines and the longest for machines of the four-bearing design.

The distance between wheels for the various machines ranges from 25 inches to 48 inches, allowing ready adjustments according to individual operating requirements. The guards are adjustable both wheel wear and location of t



Production Type 894 Grinder

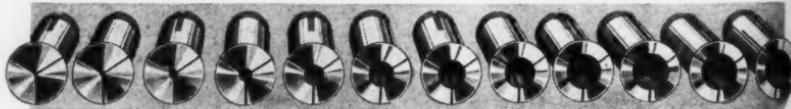
**CHAMPION EXPANDING MANDRELS**  
Accurate—Efficient  
Write for Catalog

THE WESTERN TOOL & MFG. CO.  
Springfield, Ohio

guard opening. This construction permits the adjustment of the guard close to the wheel regardless of wheel diameter, and also allows the guard to be rotated to any desired grinding position.

Standard grinders are furnished with alloy steel spindles, large-size ball bearings, oil lubrication, safety-type steel guards, flanges, automatic starters, etc.

### RIVETT DRAW-IN COLLETS AND CHUCKS



All lines of "Rivett Mark" Collets including Hendey, Cataract, Seneca, Becker and Rivett Styles can now be purchased from the following stocks:

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If your factory uses cutting lubricants, your workers must be protected from Oil Dermatitis. This serious skin disease, caused by infected cutting oils, costs factory owners millions of dollars each year through lost time and workmen's compensation. Yet one pint of Derma-San added to 35 gallons of cutting oils, ends all danger of infections. That's why thousands of plants use Derma-San. They know that prevention for all is cheaper than compensation for one.

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Harrisburg, Pa.

combination tool tray and water pot. The machine is built in ratings from 3 h. p. to 7½ h. p., for use with wheels of 14, 16, 18 and 20 inches diameter.

### Udylite Rheostat for Electroplating Processes

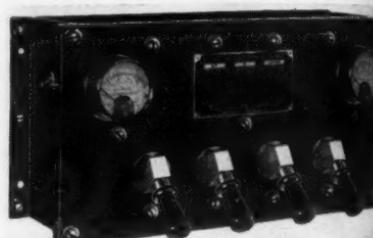
To make possible the highest efficiency in electroplating processes, The Udylite Company, 1651 East Grand Blvd., Detroit, Michigan, has perfected a rheostat into which are incorporated the features of close current regulation, ruggedness, compact construction, and simplicity of operation.

Considering that the efficiency of a rheostat depends largely upon the performance of its switches, Udylite engineers have chosen switches of the self-cleaning, constant-pressure, cam-type, of their own special design. The Udylite cam switch is designed to provide perfect contact at the low plating voltages, the contact being assured by grinding the switch leaves when the switch is in closed position. Ample contact surface and current carrying capacity have been provided.

Pressure in the switch is equalized on all leaves and is equally divided between the two contact surfaces. Inner and

outer leaves are of heavy spring bronze while the current-carrying center leaves are of spring brush copper. The leaves of the switch are actually multiple cleaning units, providing a wiping action on the surface of the bus and thus keeping the surface clean and insuring positive contact at all times.

Resistors are of helical coiled nichrome



Udylite Rheostat for Electroplating Process

wire. The low amperage coils, which generally receive the hardest service, are over-dimensioned for higher voltage drops. Coil brackets have unusually large radiating surface resulting in cooler contacts of the resistor coils. Cooling of the resistors is accomplished by a chimney draft action, and overheating is eliminated. All contact surfaces of the Udylite rheostat are coated with Udylite-Cadmium to permit positive transmission of electrical current, and all metal parts, with the exception of switch leaves and resistance coils, are Udylited to prevent the possibility of electrolytic corrosion as the result of the contact between dissimilar metals.

The ammeter and voltmeter are securely fastened to the front of the board where they are in full view of the operator. The ammeter shunt is located below the resistors, away from heat, insuring re-

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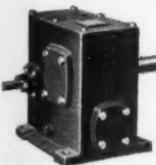
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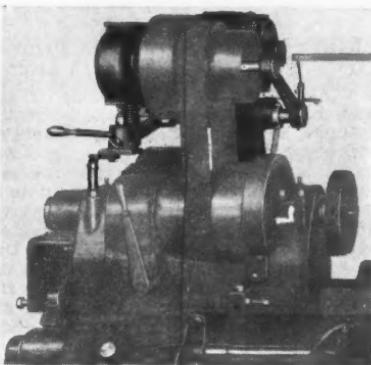
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1336 Altgeld Street, Chicago

liability of instrument readings. A double-throw, voltmeter switch is mounted on the rheostat to permit reading of the voltage drop across the tank and across the line.

The symmetrical arrangement of switches, instruments, and fastenings, together with the silvery lustre of the Udyllited parts, present an attractive contrast against the black background of the panel.

### Milligan & Wright Blue Printer

A blue print machine in which the new Angstrom blue print lamp is utilized, has been placed on the market by Milligan & Wright Company, 4618 Prospect Avenue, Cleveland, Ohio. The Angstrom lamp used in this machine is of the incandescent type and is said to offer certain advantages over the conventional arc and mercury vapor lamps. It operates from the regular 110-115 D. C. or A. C. lighting circuit without the need of transformer chuck coils. It differs from the ordinary incandescent lamp in that the light is stronger in the blue end of the spectrum.

The model 100 machine illustrated herewith is the portable table type which will print one 18 x 24, or two

12x18, or four 9x12 in. prints at a time. To make a print it is only necessary to place tracing and paper on plate glass top, lower the pressure plate and close the cover. An automatic



Milligan & Wright Blue Printer

switch is set for about two minute exposure. When the time switch clicks off, the print is removed and washed in the solutions in trays provided for this purpose. The print is then dried on a special drying board furnished with each machine.

The machine can be operated by one without damage or accident or any special electrical equipment required to operate.

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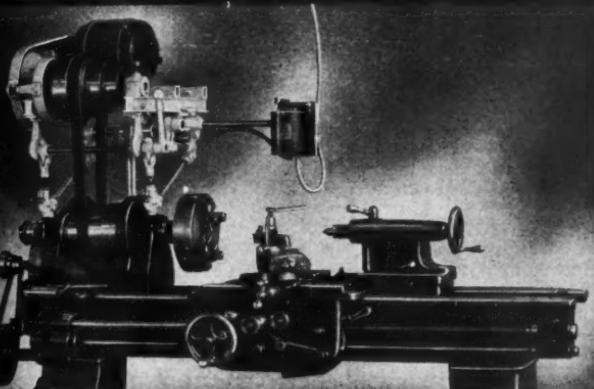
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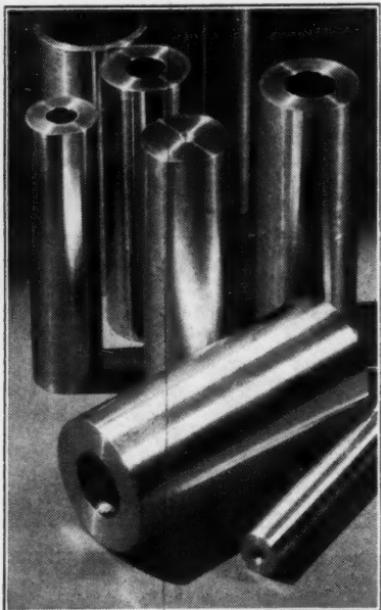
Tremendous advantages now conceded by everyone—increased production—100% flexible, place tools anywhere—decided decrease in power—100% decrease maintenance of shafting, belts, clutches, oiling, etc.

February, 1935

analysis. The line is to be known as the "Lubrico-Premier".

The outstanding feature of these bronzes consists in their ability to with-

"Lubrico-Premier" bronzes will be supplied fully finished in 7-inch lengths. A range of 64 stock sizes will be available, finished inside and outside. Little or no additional machine work is required.



Bushings of Buckeye "Lubrico-Premier" Bronze

stand friction under extremely adverse conditions. For instance, it is reported that a stock "Lubrico-Premier" bushing was subjected to a constantly-increasing friction load for more than an hour without being lubricated. The bushing became cherry red but continued to function without seizing or scoring.

### Lincoln "Toolweld" Electrode for Hardfacing Cutting Edges of Tools

An arc welding electrode designed for restoring worn cutting edges on tools of all kinds, and which is said to permit savings of 20 to 25 per cent on tool costs is announced by The Lincoln Electric Company, Cleveland, Ohio.

The new electrode, to be known as "Toolweld", is the result of several years of research. By applying this electrode, lathe tools, milling cutters, drills, cutting and forming dies, and other tools that have become worn in service can be given new and harder cutting edges than has heretofore been possible. Tools can be refaced an unlimited number of times with this electrode.

An added saving on tools cost can be made by using shanks of ordinary steel and providing the tools with cutting edges of "Toolweld." The metal deposited by "Toolweld" electrode is said to be equivalent to high speed steel, and has the advantage of retaining its hardness (55 to 65 RockwellC) under relatively high temperatures up to 1,000 degrees Fahrenheit. However, the deposit can be heat treated in the same manner as high speed steel, but at slightly lower temperatures.

"Toolweld" provides typically dense non-porous shielded arc weld metal. The electrode is covered with a coating which, as it is consumed in the arc, shields the arc from the atmosphere and prevents the formation of oxides and nitrates in the weld metal. The coating also helps



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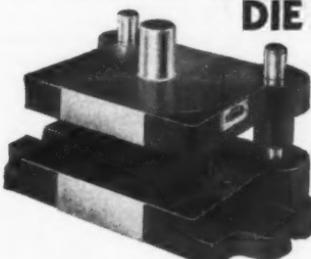
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to steady the arc and insures a smooth, uniform weld deposit.

"Toolweld" electrode is made in 14-inch lengths in four sizes; 3-32 inch, 1-8, 5-32, and 3-16 inch. It is marketed in 5-lb. containers.

### General Electric Limit Switch No. GEA2052

A switch that will make or break controls or will indicate circuits at a fixed point in the travel of a machine or mechanism, illustrated herewith, has been developed by the General Electric Company, Dept. 6-201, Schenectady, N. Y. The switch supplies a simple and convenient means of interlocking mechanical motion with electrical control circuits for automatic operation of mechanical processes, operating safety devices, and so on.

The switch has one normally-open and one normally-closed circuit. Maximum carrying and breaking capacity is 5 amperes at 550 volts a. c., and from 0.4 ampere at 550 volts to 2 amperes at 115 volts d. c. Operation occurs on an 188-degree movement of the operating arm from normal position, and overtravel of as much as 54 degrees will not cause damage to the mechanism. The arm can be adjusted to any posi-

tion around its shaft and can be set in exact location.

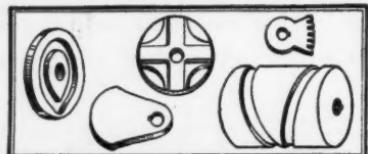
The precision mechanism, supplied for this purpose in the design, consists of a worm-and-gear arrangement in which the threads on the clamping bolt act as the "worm" to engage "gear" threads



General Electric Switch No. GEA 2052

on the shaft. The contacts are double-break, silver-plated. They open and close with a sliding action to maintain good electrical contact.

The switch is die cast and is 4 inches in height by 2 7/16 inches in width and 1 29/32 inches in depth. The operating arm moves in a plane parallel to the base; thus no right-angle mounting bracket is required. The switch can be mounted at any angle without affecting its operation. The mechanism is protected by an aluminum cover.



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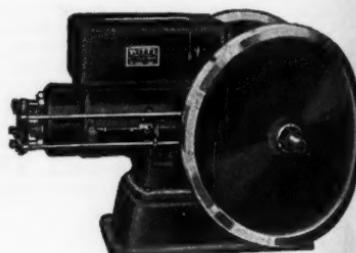
### Witte Diesel Engine

The cost of power is an important item in the operation of a manufacturing plant, and savings made on the power bill are just as important as savings made on the production line. The design and construction of a power plant for a large industry involves a special study of the conditions and an array of plans drawn up by power plant engineers, but the operator of a small plant can purchase a complete power unit, ready for operation the minute it is set up, in the form of a modern Diesel engine.

After eleven years of research and experimentation the Witte Engine Works, 1722 Oakland Avenue, Kansas City, Missouri has perfected a horizontal type, hopper-cooled, four-cycle Diesel engine that is especially adaptable for small plant operation.

The Witte Diesel engine is built in 5, 10, and 15 h.p. sizes. The fuel cost is said to be about  $\frac{1}{4}$  the cost of gasoline for an engine of comparable horsepower. Where power is required for more than three hours per day, or 1000 hours per year, the manufacturer states that the Diesel engine will pay for itself within a year in the saving of power costs.

The 5 h.p. engine is 4 $\frac{1}{4}$  in. bore x 6 in. stroke and operates at 850 r.p.m. The 10 h.p. engine has 5 in. bore x 8 in. stroke and operates at 720 r.p.m. The 5 and 10 h.p. engines are easily started.



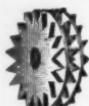
Witte Diesel Engine

with a crank, due to a patented feature. Air-operating starting equipment will be furnished on the 15 h.p. engines. The Witte Diesel engine is so designed that it requires no pre-combustion chamber, hot tubes, or hot bulbs. The engine is cold starting solid injection full Diesel compressing fresh air to 530 lbs. before ignition takes place—which occurs under 1500 lbs. pressure.

Timken roller bearings are used on the crank shaft, which is of special size and of heavy design. All parts are interchangeable and may be replaced as units. The rods and crank pins are counterbalanced and a sensitive governor holds the maximum variation to less than 5 per cent. Speeds may, however, be increased or decreased 15 per cent from normal.

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